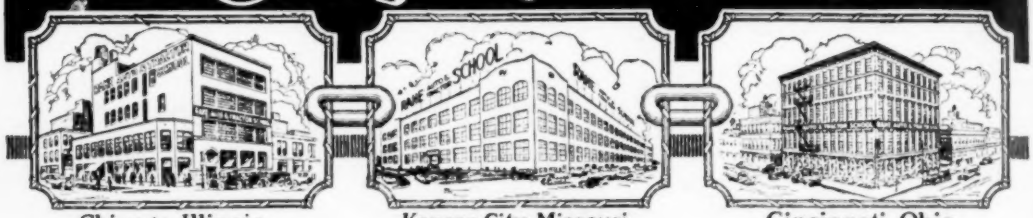
December 25 Cents

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

Now 3 Big Rahe Schools



Chicago, Illinois
~ MICHIGAN AVE ~ ONTARIO ST. ~

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I have brought the Rahe-Way OF AUTO & TRACTOR TRAINING to YOU

OPPORTUNITY *is now hundreds of miles closer*

NOW you have the choice of THREE BIG RAHE SCHOOLS. I have established the famous RAHE-WAY of Automotive Training in Chicago and Cincinnati, as well as at Kansas City. To thousands of young men, OPPORTUNITY now is hundreds of miles closer—as near as Chicago or Cincinnati.

Hundreds Train at Cincinnati

For 14 years I have been teaching Auto and Tractor training at Kansas City. The great success of my school meant I must expand—add more floor space or establish new schools. Why not, I thought, take Automotive Training to the thousands of men who could not come to Kansas City? My idea proved sound. The Cincinnati School has been a big success from the day its doors were opened. From the Eastern, Southern and Central States, hundreds of students have poured into Cincinnati.

Chicago School is Popular

Now the Chicago School is going full-blast. It is a full-fledged, independent institution, teaching the famous RAHE-WAY, equipped just the same as the other RAHE Schools. Already hundreds of students are in training. Hundreds and thousands more are coming. Why?

This Is An Automotive Year

More money is being spent this year than last for auto and tractor upkeep and repair. THREE BILLION DOLLARS this year to keep autos running. You can have a big part of this $3,000,000,000.00 if you train yourself the RAHE-WAY—the Practical Job Method of teaching Automotive Mechanics. You can

Make $150 to $400 a Month

RAHE Graduates everywhere are making Big Money. This is YOUR opportunity to BREAK AWAY from LOW PAY. Clip out the Coupon and send it today. It will be one of the most fortunate things you've ever done.

This Big 68-Page Book Describes the RAHE-WAY—tells how thousands have learned Automotive Training. Shows how Big Money is made. It is FREE to you. Write today. Clip the Coupon and send for it NOW.

HENRY J. RAHE, Dept. 2893

Chicago, Illinois. Michigan Ave. & Ontario St. **Kansas City, Mo.** 22nd and Oak Sts. **Cincinnati, Ohio.** 9th & Walnut Sts.

MONEY MONEY *more* MONEY

Thousands of men come or write to me—

"How can I make more money? I want a better job—more pay—a bigger future."

I answer them—"Know how to do some one thing well. Be a trained man. Learn by actually doing, under competent instructors, the work you would like most to do. Become an expert in the best paying business today—the Auto Service Business."

Come to a RAHE School. Learn Auto Mechanics *thoroughly*. Qualify for BIG MONEY Jobs. Don't delay. Write for my 68-page catalog. Write TODAY.

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Write Now for Money-Saving LIFE SCHOLARSHIP OFFER!

Send this coupon today for my fine 68-page Catalog showing graduates success and opportunities now open. (Address nearest School.)

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Popular Mechanics Magazine

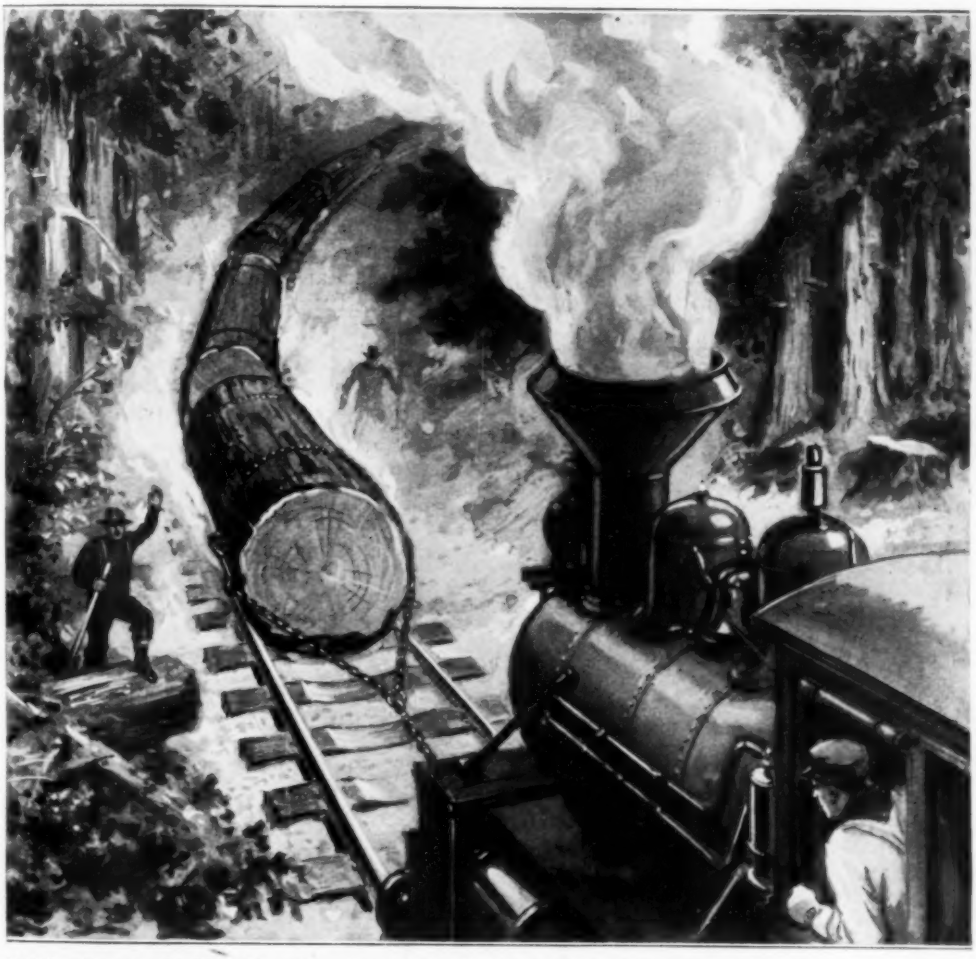
REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

VOL. 36 DECEMBER, 1921 No. 6

Logs Skidded to Mill without Flumes or Cars

A LOGGING company in the mountains near Seattle, Wash., has adopted a novel method of skidding out logs without the use of flumes or railroad cars. A logging railroad runs from the point where the logs are cut, to a millpond several miles away. The ties have been hollowed out between the tracks and sprinkled with "skid grease," forming a track similar to the common skid road. The logs are rolled into the hollow between the rails and "dogged" together with chains in strings of as many as twenty. They are then hooked onto a logging engine and hauled to the millpond. A speed is often attained which



Skidding Logs to the Mill without Loading onto Cars: The Engine Hooks onto a String of 20 Logs and Hauls It along a Skidway between the Tracks. This Method Is Both More Rapid and More Economical Than the Usual Method of Hauling on Flat Cars, Especially in Rough Mountain Country

causes considerable smoke from the friction of the logs against the ties. At the millpond the logs are easily rolled by hand down an incline into the water.

NEW RIDING DEVICE IS USED ON THE DANCE FLOOR

An amusing sort of ride is obtained with a new device propelled as if dancing. A bicycle seat, for the gentleman, is mounted on a circular frame resting on rubber-tired wheels. In front of this is a high cushioned seat with a canvas backrest for his "dancing" partner. The man rests his feet on the floor and, by going through the movements of the dance steps, propels the car about the room. The device moves quite easily and cannot be upset. Several of these in a large hall, with suitable music, furnish considerable pleasure and amusement particularly with the type of crowd to whom the novelty show appeals.

This Dancing Car Moves Easily about the Floor on Its Rubber-Tired Wheels When the Man Propels It by Dance Steps

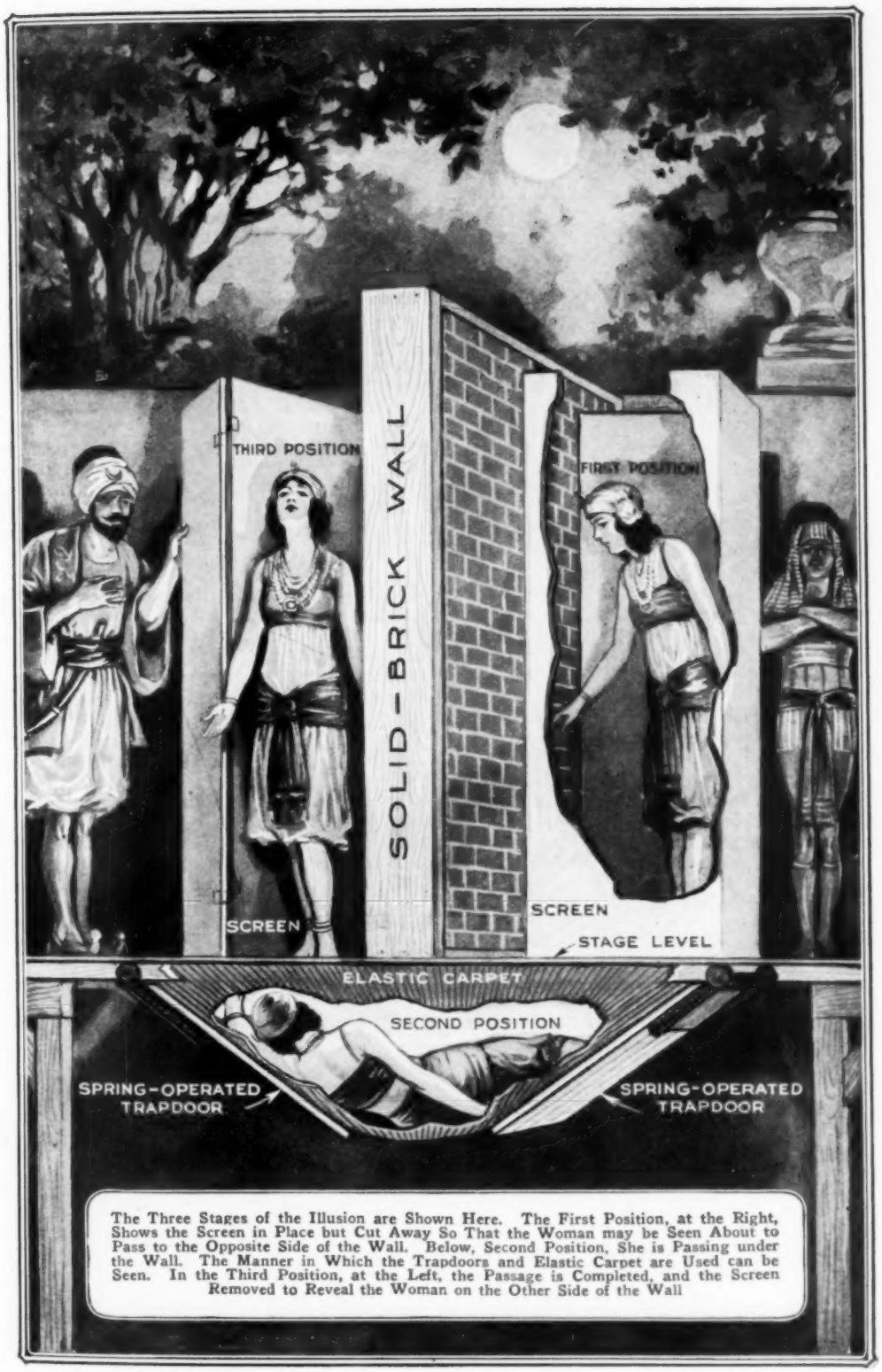
COLOR REMOVED FROM SUGAR LIQUOR BY LIGNITE CARBON

To remove the color from sugar liquor, so that white refined sugar may be obtained from it, the only substance heretofore used has been animal boneblack. Recent experiments have demonstrated that carbonated lignite will not only successfully take its place, but actually do the work better and more economically, because of the abundance of the material and its greater effect as a decolorizing agent. The carbonized lignite retains the porous structure of the original vegetable matter, and upon this fact its superiority over boneblack is derived. In using boneblack to decolorize the sugar liquor, a quantity equal in weight to the dry sugar contained in it has to be used, while only one-twentieth as much of the carbonized lignite is required.

WALKING THROUGH A WALL MYSTIFYING TRICK

At performances in England, a woman apparently accomplishes the impossible feat of passing through a solid brick wall. The wall is built on the stage, in the presence of the audience, by genuine bricklayers, secured through advertising. It is 8 ft. high, 10 ft. long, and 9 in. thick, and is built in a wooden frame to assist in holding it together and facilitate moving it about the stage. Several members of the audience are invited to the stage to inspect the wall and the floor covering. The latter is raised with ropes to aid inspection. Everything is normal, just as represented. The wall, standing on the carpet, is turned with one end toward the footlights so that both sides are visible. A screen is placed about the woman as she stands on one side of the wall, so that the exact method of passing through cannot be seen. A second screen is placed about the spot on the opposite side where she will emerge. Then the two screens are removed. The woman is standing on the other side of the wall. Otherwise nothing is changed. Like all well-executed illusions, it is simply accomplished.

A specially prepared carpet is used, the center of which is of material permitting considerable stretch. This center is directly under the wall and over a special trapdoor, in the stage floor. When the screen is placed about the woman, she merely sinks to her knees, forcing open the trap by the weight of her body, crawls under the wall, and rises to her feet on the opposite side. The trap is closed by the pressure of heavy steel springs, and the elastic portion of the carpet springs back into place.



The Three Stages of the Illusion are Shown Here. The First Position, at the Right, Shows the Screen in Place but Cut Away So That the Woman may be Seen About to Pass to the Opposite Side of the Wall. Below, Second Position, She is Passing under the Wall. The Manner in Which the Trapdoors and Elastic Carpet are Used can be Seen. In the Third Position, at the Left, the Passage is Completed, and the Screen Removed to Reveal the Woman on the Other Side of the Wall

UMBRELLAS OF OILED PAPER FOR EMERGENCY USE

Almost everyone has been caught unprepared by a sudden rain and has wished he might buy an umbrella, for the emergency only, without investing a dollar or more. An umbrella, which will meet that want, has recently made its appearance. The top is of heavy oiled paper, which sheds water effectively, and the handle is of cheap wood. Its cost is far less than the price for pressing a wet and wrinkled suit.

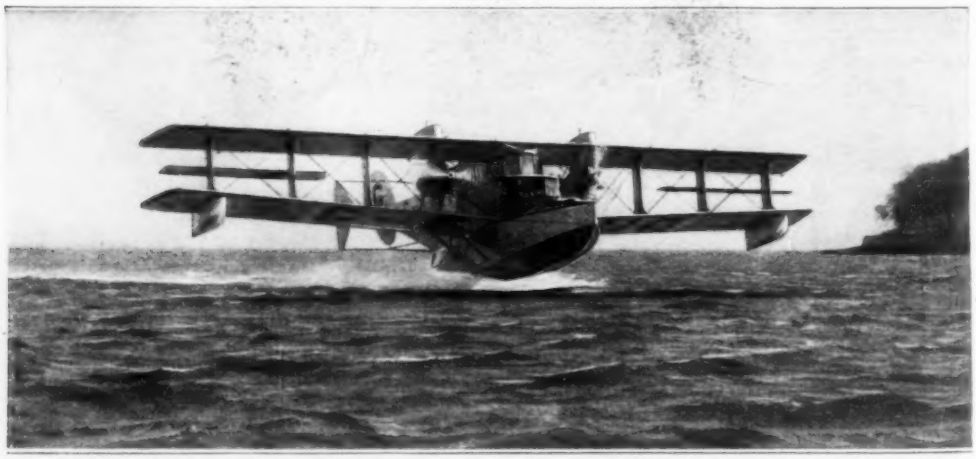
The Oiled-Paper Umbrella may be Used Several Times, but if Only Used Once, in an Emergency, It Is Worth Its Price of 25 Cents

PORTABLE GASOLINE PLANT TESTS CASINGHEAD GAS

Extracting gasoline from natural gas has become such an industry that a practical method for determining the gasoline content of a gas, before building a plant, has become necessary. As the laboratory method often is inconvenient and impractical, an Oklahoma man solved the problem by simply mounting a miniature extraction plant on an automobile chassis. The plant consists of a small two-stage compressor, vacuum pump, scrubber, intercoolers, and accumulator tank. Power is supplied by the automobile engine, through an auxiliary shaft. Results with this outfit compare very closely with those obtained from an actual plant, thus showing its practicability.

COMBINATION LAND AND SEA PLANE OF ORIGINAL DESIGN

A European-built seaplane, the "Kittiwake," equipped with landing wheels, follows entirely original ideas in flying-boat design. The hull is a V-bottomed hydroplane which can be removed and replaced if damaged. At each side it contains a box structure, closed by a trapdoor, into which the landing gear can be raised. The body above the hull houses the pilot and mechanic and also contains a cabin accommodating five passengers. The wings are built up on two spars of normal box construction, with girder-type ribs between. A single row of bracing and I-form struts is used. Leading and trailing-edge ribs of duralumin are hinged to the front and rear spars, and are operated up or down simultaneously. Wind-tunnel tests indicate that this form of variable wing will permit a low landing speed, a quick take-off, and high speed. Lateral control is by balanced interplane surfaces. All parts, except the struts next the fuselage, which are of duralumin expanded into streamline mountings for two 200-hp. motors, are covered with a special plywood.



The New Type of Seaplane Rising from the Water: The Inclosed Cockpit for the Pilot and Mechanic can be Seen Just above the Hull and Well Forward. Above It Is the Main Cabin for Passengers

WORLD'S BIGGEST NAVAL GUN TESTED AT ABERDEEN

Ordnance Experts Examining the New 50-Caliber 16-Inch Rifle at the Aberdeen, Maryland, Proving Grounds: Tests Demonstrated It to Be the Most Powerful Gun in Existence. It is Mounted on a Barbette Carriage, and is Elevated and Turned Laterally by Electric Appliances. It Has a Calculated Range of 35 Miles

Ordnance experts, at the Aberdeen, Md., proving grounds, made the first tests, on October 7, of the new 50-caliber 16-in. naval rifle, that proved it to be the most powerful gun in existence. It has a calculated range of 35 miles, with a 2,300-lb. projectile. On account of the haze, the long-range tests could not be made, however, and the projectiles were fired only 20 miles. The gun is mounted on a barbette carriage that permits an elevation of 65°, which is necessitated by the trajectory, or curving course of the projectile, of such a long range. The huge weapon is operated electrically, and can be turned laterally and elevated by one man. During the tests a heavy block of armor plate was completely penetrated in three places. A great number of ordnance men and engineers witnessed the tests.

Crowd of Ordnance Experts and Others Viewing the Holes Made in a Heavy Armor Plate by Three Projectiles from the New 16-Inch Naval Gun: On Account of Hazy Weather It could Not be Tested for Its Extreme Range

COLLECTION OF CLIPPINGS PRESENTED TO MME. CURIE

Madame Curie, the famous woman scientist and discoverer of radium who was the recipient of many honors during her recent visit to the United States, has now been presented with a set of books containing press clippings concerning her visit. The set consists of 11 volumes. Each volume measures 21 by 14 in., is 3½ in. thick, and is bound in full levant morocco leather. The collection was compiled and presented by the United States Radium Corporation of New York.

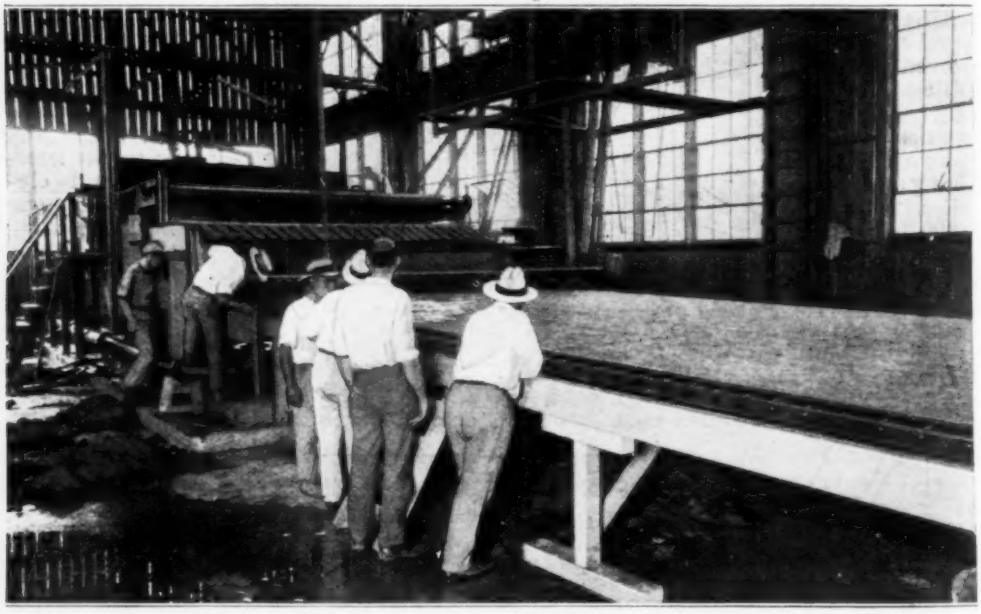
SUGAR-MILL WASTE YIELDS DURABLE BUILDING MATERIAL

By THOMAS EWING DABNEY

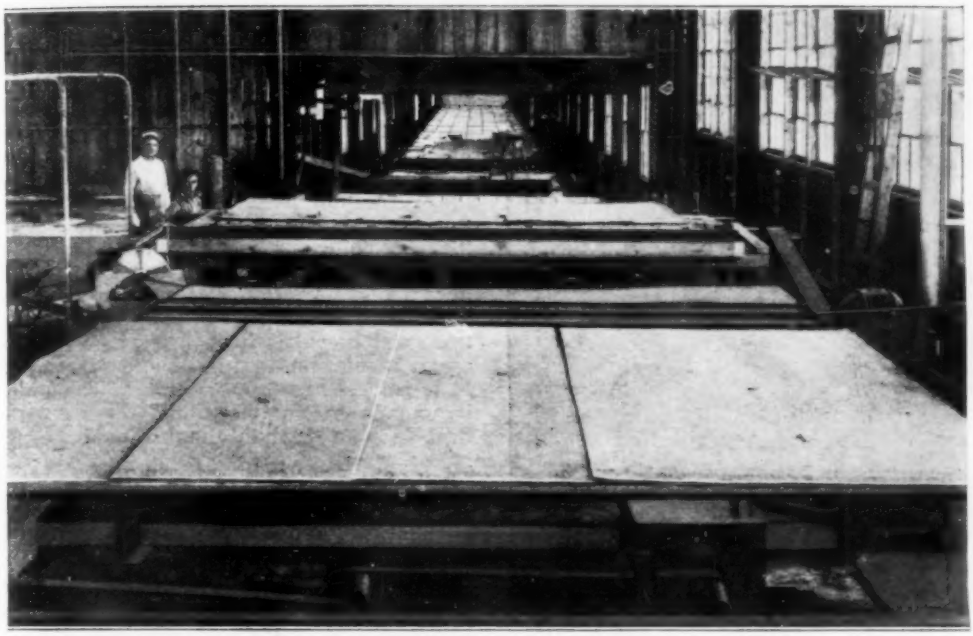
ONCE more science has turned a waste product into one of commercial value. This new achievement is the making of building board from the refuse of sugar cane after the juice has been pressed out at the sugar mill. The refuse, known as bagasse, is about 10 per cent of the weight of the entire sugar-cane crop and amounts to 250,000 to 500,000 tons a year. Its disposal has long been a problem, and the original practice was to burn it in great piles. During the grinding season the smoke of the burning piles clouded the whole countryside, in the sugar-cane regions. Mark Twain, in his "Life on the Mississippi," says that the bagasse "fog" was the bane of the river pilots. Later it was discovered that bagasse could be used as a fuel, to fire the boilers of the sugar mills. In this way it attained a certain value, but the more recent discovery materially increases that value. It is now being made into a substitute for lumber which possesses peculiar qualities, and for some purposes is superior to wood.

Baled Bagasse, the Waste Product of Sugar Mills, being Received at the "Lumber Factory" Where, by a New Process, It is Made into a Building Board Which Serves as a Substitute for Wood

The first plant for manufacturing bagasse "lumber" was built in New Orleans, at a cost of $500,000, and began operation late last August. It is the result of two years of experiments by experts in the fiber and insulation busi-



After Passing through the Cooking and Beating Processes, the Pulp is Subjected to Great Pressure and Rolled Out, between These Steel Rollers, into Continuous Sheets, 12 Feet Wide. It is Then Dried and Heated, to Harden It

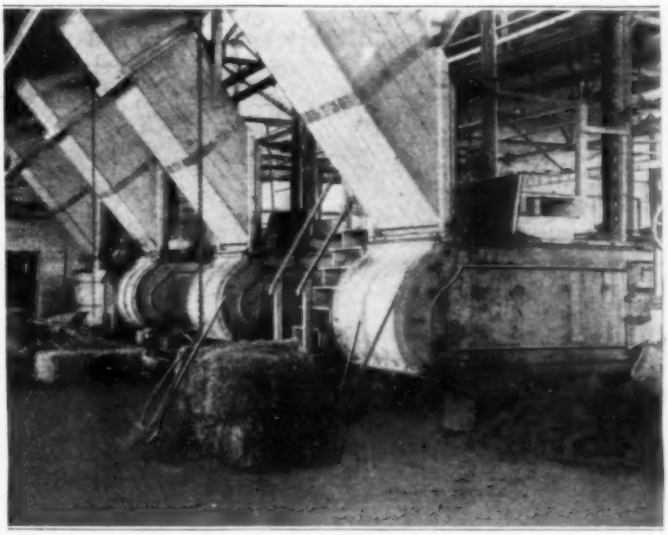


The Cutting Room Where the "Lumber" is Taken When Thoroughly Dry: Here Three Traveling Saws Cut the Sheets, in Exactly the Same Way That Lumber is Cut, into Pieces of Any Desired Size. The Standard Boards Are 12 Feet Long, 4 Feet Wide, and ½ Inch Thick

ness, and utilizes a patented process. The bagasse is baled, as it comes from the rollers of the sugar mill, and shipped to the "lumber factory." There it is first cooked to destroy the decay-producing spores and is treated with chemicals to make it waterproof. It then passes to beating machines, which pound it to a pulp. When thoroughly beaten, it is passed through rollers and compressed into a continuous sheet, 12 ft. wide. At this stage it is soft and must be dried.

The drying building is more than 1,000 ft. long. Here the product is subjected to intense heat by means of coiled steam pipes placed beneath the floor. The finished lumber comes out in sheets 12 ft. wide and 900 ft. long, sufficient material to build three or four five-room bungalows. It is sawed, in the same manner as ordinary lumber, into standard-size sheets, 4 by 12 ft., though of course it may be cut into any other sizes.

Small air cells between the fibers of the material make it very light, ½-in. lumber weighing only a little over ½ lb. per square foot. Handling it, in any sizes that can be shipped by rail, is simple. A man can carry an 8 by 24-ft. piece, containing 192 ft. board measure, but weighing less than 100 pounds.



From the Cookers, Where the Decay-Producing Spores are Destroyed, the Bagasse, Mixed with Chemicals, Passes to These Pulping Machines

One of These Standard-Size Boards, 4 by 12 Feet, Is So Light That One Man can Handle It Easily. It Weighs About 24 Pounds

The product is waterproof. As a test, a piece was left in water for 20 days and absorbed only .1 per cent moisture, by weight. The outside was barely permeated. Because of this, it can be used for exterior as well as interior work. In fact any part of a house may be built of the material, except uncovered floors, doors, millwork, and heavy timbering. It will not decay even if not painted, and has a pleasing color. It takes calcimine or paint quite readily, and plaster and stucco adhere to it tenaciously. It even can be used as a roofing. The cellular formation, which makes it so light, also serves as an insulation against sound and heat. It is said that a house built of it would be cooler in summer, and require less heat in winter, than the ordinary frame house.

One ton of bagasse is required to make 3,000 ft. of lumber, so the total possible production from the waste of Louisiana's cane land would be from 750,000,000 to 1,500,000,000 ft. a year, if there were sufficient manufacturing facilities to use it all, but this first factory can only handle a fraction of this total.

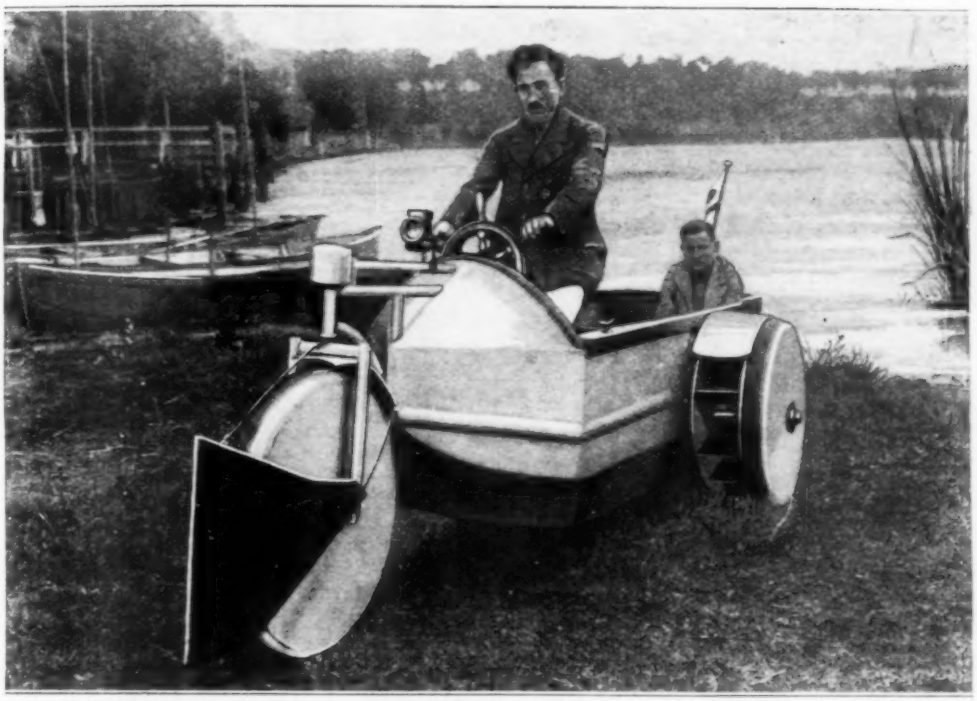
SMALL ROOFS PROTECT TROUT IN HATCHERY POOLS

The trout is naturally a cold-water fish. He lives in streams fed by cold spring water or, in mountain country, by melting snow. In hot weather he seeks the deep pools and the shelter of logs, rocks, or overhanging banks. These natural conditions are difficult to reproduce in the artificial pools of a fish hatchery and so a substitute must be provided. At the State Fish Hatchery, at Paris, Mich., miniature roofs have been built over part of the trout pools. In hot weather the fish stay close in the shade of these roofs and are well protected from the heat of the sun.

These Miniature Roofs are Built in the Trout Pools of a Fish Hatchery. In Hot Weather, the Fish Stay Close under the Roofs

SHEEP HERDS IN AUSTRALIA PROTECTED FROM WILD DOGS

Australia has long been troubled with animal pests. Sheepowners there have had to guard their pasture lands from the devastating droves of innumerable rabbits, and now they have to guard their sheep from the depredations of wild dogs, known as "dingoes." These pests are barred from the sheep lands by means of a fence which is dog-proof, and every owner of land is compelled by law to kill the dogs that appear in his territory. A law of this nature, it appears, is rigidly enforced in Australia, and there will be no possibility of one lax landowner disregarding its observance to the detriment of his neighbors.



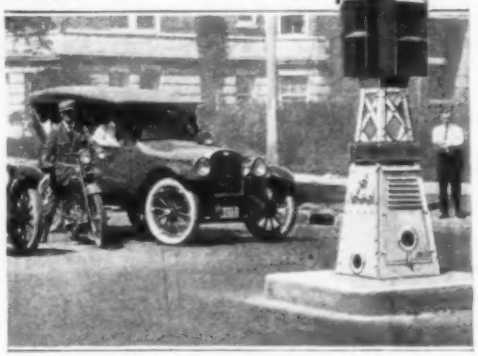
The Automobile-Boat has Just Emerged from the Water. The Method of Mounting the Paddles upon the Rear Wheels can be Seen Clearly Here, as Well as the Mounting of the Front Wheel

WHEELS PROPEL AUTO-BOAT ON LAND OR IN WATER

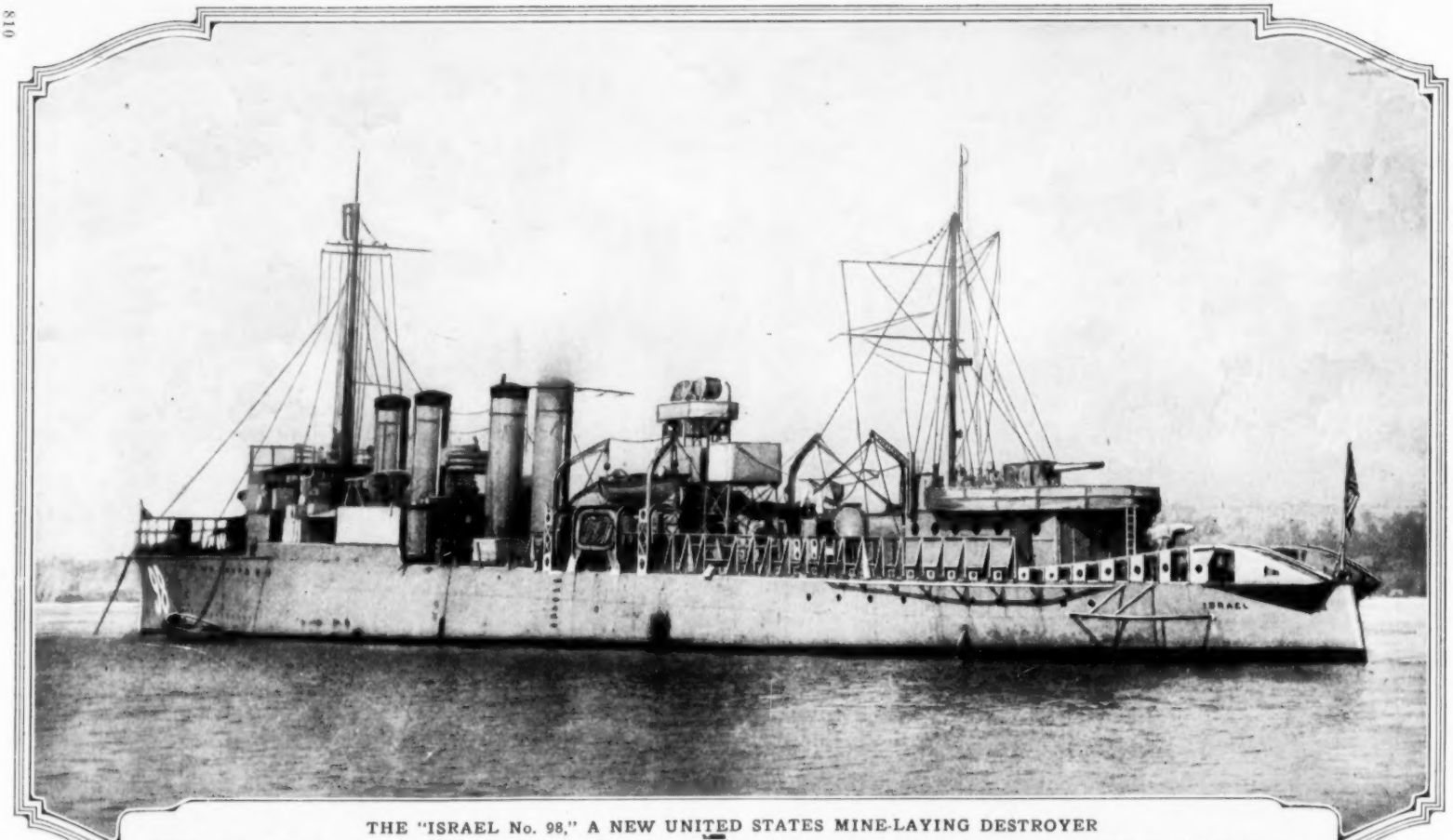
A combination automobile and boat, lately built in Europe, is propelled by the same wheels, whether traveling on land or in the water, no change of gear or power being required in going from one to the other. This is accomplished by means of paddles mounted on the inner surfaces of the two rear wheels and covered by broad "mudguards." The body resembles a boat hull. At the front is a single wheel mounted much like the front wheel of a motorcycle. This is a solid disk wheel, on which is mounted a rudder-like shield, and is used for steering both on land and water. It is controlled by means of a marine steering wheel. Should the engine become stalled, this odd vessel can be propelled by means of a pedal arrangement.

AUTOMATIC TRAFFIC CONTROL PREVENTS CONGESTION

By synchronizing traffic, the inventor of an automatic traffic controller claims that congestion will be largely averted. With the present system, traffic at one corner may be going north and south, while at the next corner it is going east and west. The result is congestion. With an automatic traffic controller at each corner, the same signal can be simultaneously flashed by all the controllers. The device consists of go, stop, and traffic-change signs on top of a small tower. The lights are operated by a small motor, 30 seconds being allowed for the traffic each way. Three seconds before changing, a traffic-change signal lights, warning the motorist. It has been successfully tried out in Milwaukee.



The Controller being Tried in Milwaukee: The Shutterlike Arrangement Is to Prevent the Light from being Seen from the Side



THE "ISRAEL No. 98," A NEW UNITED STATES MINE-LAYING DESTROYER

THE unusual deck construction at the stern of this vessel is to facilitate the lowering of mines with safety. Amidships is another construction characteristic of these new mine-laying destroyers, in the form of a high platform from which a very powerful searchlight is operated. The "Israel" is 314 ft. long, with a beam of 31 ft., and a speed of 41½ miles an hour.

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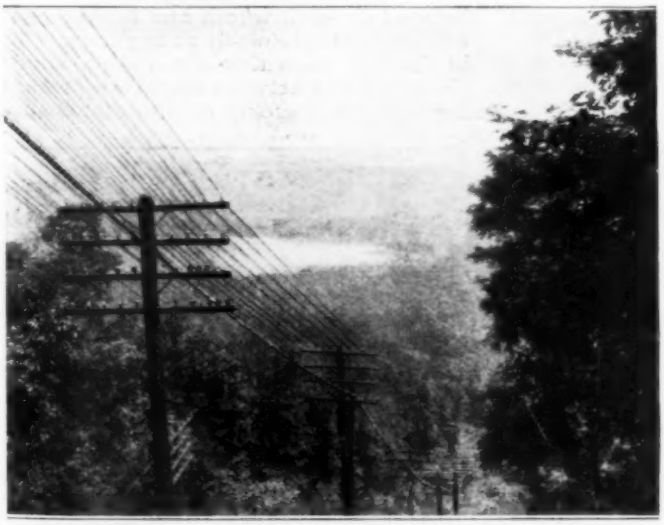
DINING TABLE IS MADE FROM SPRUCE LOG

Two young women proprietors of a camp in northern Maine conceived the idea of making a table out of a single spruce log. The log was first cut in two and the halves milled down with a broadax until they were nearly alike in size. The flat sides were then planed until a smooth surface was obtained. The upper portion of the tree from which the log was taken formed the legs and underframe of the table. After placing the log sections side by side on the rustic underframe and with their flat surfaces upward, filler and varnish were applied until a bright finish was obtained, with a polish of high quality.

Dining Table Made by Splitting a Spruce Log, Trimming the Flat Faces with a Broadax, and Finishing Them with Filler and Varnish: The Legs and Underframe are Made from the Upper Part of the Same Log. The Table Is in a Rustic Camp Building in Northern Maine

NEW YORK-CHICAGO CABLE IS ENGINEERING FEAT

A continuous telephone-telegraph cable between New York and Chicago, in which all recent improvements of these means of communication have been applied, will be one of the notable engineering achievements of this age. The line is now well under way, but on account of the rough country encountered, construction methods were required which called for all the resourcefulness and ingenuity of the corps of skilled engineers.

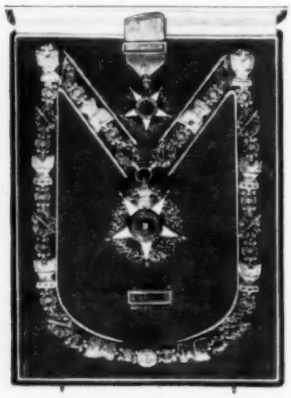


The Section of New York-Chicago Cable between Harrisburg and Pittsburgh Passes through Some Rough Country. The Cable Is the Equivalent of Eight Open-Wire Pole Lines, Having from 220 to 290 Telephone Circuits, and from 175 to 200 Telegraph Circuits

The cable is not only remarkable because of its length and difficult construction, but also on account of the tremendous amount of material used. The portion now under construction between Harrisburg and Pittsburgh, Pa., consists of 2,000 sections, with a total weight of 4,000 tons. Splicing these sections, alone, has taken nearly 20 tons of solder, 15 tons of paraffin, and 7,000 sq. yd. of muslin, while the pole line required over 13,000 chestnut poles. The cable used will provide 220 to 290 telephone circuits, and 175 to 200 telegraph circuits, or the equivalent of eight open-wire pole lines.

FAMOUS PORTUGUESE MILITARY ORDER HONORS "NC-4" CREW

Because the United States flying boat, "NC-4," first landed on Portuguese soil after its transatlantic flight, the famous "Military Order of the Tower and Sword of Portugal" decided that it was appropriate for them to honor the members of the crew. A decoration for "Valor, Lealdade e Merito" (courage, loyalty, and merit) has been presented to each of the men. Those given to the officers are of gold, and those for the men of silver. The decoration is in the form of a chain of tower and sword emblems terminating in a star, to be worn on state occasions. A smaller star, hung on a ribbon, is provided to be worn on ordinary occasions.

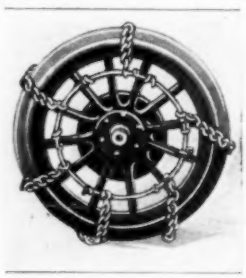


TREASURE HUNTING POPULAR SPORT IN CORONADO ISLANDS

Hunting pirate caves has become a favorite sport on the Coronado Islands, which lie about 25 miles off the coast of Lower California. Late last August a party of visitors was exploring one of these islands when one of them, in sport, overturned a large rock in one of the numerous caves. To his surprise, he uncovered a cache containing 22 silver coins of early Spanish origin, a skull, grass garments, and other objects, indicating that the cave had been used by one of the pirate bands which preyed on ships bringing settlers to the Pacific coast in the early years of the nineteenth century. As a result of this discovery, parties are being formed to search the other caves of the islands in the hope of finding other caches. There are several hundred caves, scattered over this group of seldom-visited and little-known islands, which will be carefully explored.

NEW TIRE CHAIN IS QUICKLY AND EASILY ATTACHED

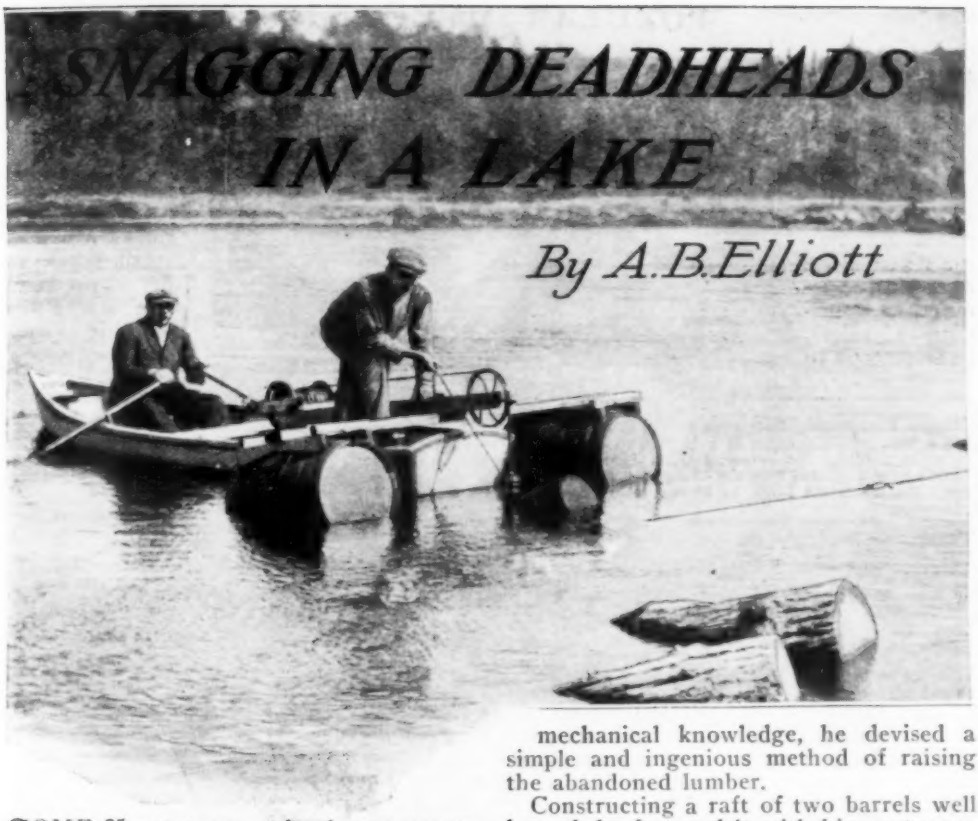
A new tire chain for trucks overcomes most of the weaknesses of ordinary chains. Two metal hoops are permanently attached to the spokes of each wheel, one on the inside and one on the outside of the wheel. When needed, short lengths of chain can be snapped onto these hoops without using any tools and without moving the truck. As many chains as desired can be used on each wheel, and broken links can be replaced quickly at any time. The method of attaching the chains allows them to creep between the spokes, resulting in great economy of tires and chains.



The Map Shows the Location of the Coronado Islands, Where the Pirate Cave was Found, Directly West of the Boundary between California and Lower California. At the Right: The Cave, One of Hundreds on These Islands, Which Contained the Treasure. An Old Spanish Coin, Part of the Find, is Shown in the Insert

SNAGGING DEADHEADS IN A LAKE

By A. B. Elliott



SOME 25 years ago, a lumber company in northern Wisconsin ceased operating, leaving behind several hundred thousand feet of deadheads which had sunk in the lake at the site of the mill. Broken and rotted timbers and piles of brick are the only remains of the old mill, but the lumber in the lake is in as perfect condition as when it went to the bottom.

Since then, there have been sporadic efforts by the former owners to salvage the timber, by various methods, with teams and grappling hooks, men in bathing suits, etc., all of which have proved costly and impracticable.

The old mill site and the surrounding cleared land were recently purchased by a master mechanic from Illinois, who, tiring of the factory, turned to the farm. The problem of the treasure in the lake interested him, and utilizing his mechanical knowledge, he devised a simple and ingenious method of raising the abandoned lumber.

Device for Snagging the Logs: It is Fastened to the End of the Lifting Cable. The Large Nail at the Bottom is Driven into the Log by Letting Fall the Sliding Weight on the Rod

Constructing a raft of two barrels well braced, he fastened it with hinges to one of the rear seats of a rowboat, thereby taking all strain off the boat itself. A steel cable on a small hand winch is run out over a wheel fastened between the two barrels. The device for snagging the logs, which is fastened to the end of the cable, is a rod, at the bottom of which is a screw cap permitting a large nail to be inserted and fastened securely. A rope is fastened to a sliding weight upon the rod. Letting the weight fall upon the top of the cap drives the nail into the log. If it is caught in a jam, the nail may be released by pulling the weight upward against the head of the rod. After several logs have been secured, the nail having been bent and straightened several times, a new nail is inserted. After a deadhead has been raised to the surface, a wire snare tied to a rope held by the worker on the shore, is

placed over the end of the log, and the whole outfit is pulled to the shore, guided and helped by the man at the oars. The operation requires a minimum of effort, and some 40 to 60 logs are easily recovered in a day. As the logs in their normal condition would float, it takes only a small force to lift them, and the barrels provide sufficient buoyancy.

Upper View Shows Outrigger Which is Hinged to a Seat near the Stern of a Boat, and Which Carries a Winch for Winding Up a Line That Runs over a Sheave into the Water for Raising the Deadhead Logs, as Shown Below

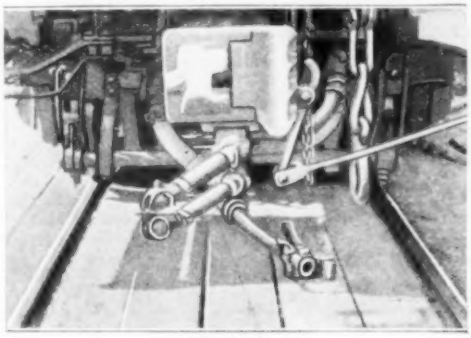
LENGTH OF TELEPHONE TALK CONTROLLED BY TIMER

For party lines particularly, a telephone-conversation timer that is now in use in France, might be advantageously adopted elsewhere. In France the apparatus is applied to a wall telephone, and on the wall above it is a box with a ground-glass front. Inside the box is an electric light which becomes automatically incandescent when the conversation is within half a minute of its allotted time. This period is printed on the glass front, as for instance, "When Extinguished: 3 Minutes," the light warning the talker that in half a minute the allowable period of conversation will expire, and the light will go out, cutting off communication. At central is another box with a similar light. Underneath this box are clocklike timers which the operator watches. A handle on each clock starts and stops the communication. When desk telephones are used, the signaling light could be placed on the wall above the ringer box. In France it is used for telephone booths, the number of the booth being signaled to central on a pane of ground glass above the clocks.

At the Right Is the Telephone-Talk Timer: Behind the Ground-Glass Front of the Box above the Telephone Are the Timing Lights. At the Left Is the Timing Apparatus at Central, Started and Stopped by a Handle below Each Clock

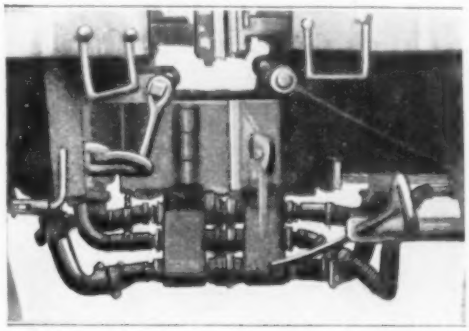
AUTOMATIC AND COMBINED CAR AND HOSE COUPLER

Automatic hose coupling is as desirable as automatic car coupling on railroads. After many years of experimenting with hundreds of different devices to accomplish the latter, finally a standard car coupler was adopted, which is now practically universal in this country. The hose coupler is going through the same course of experimentation, and, no doubt, of the very many different automatic couplers under exploitation, finally one will be selected as the standard. One such device that is now under trial, is a combined car and hose coupler; that is to say, the car and hose couplers are a unit. One impact couples both. The uncoupling is done by means of a release rod on one side of the car. The



Automatic Car and Hose Coupler Shown with Short Connections That are Provided for Interchange Service with All Makes of Standard Couplings Now in Use

surfaces engaged in this coupler are all beveled, so that it is impossible to fail to make the coupling on any curve. The vertical motion is taken care of in the same manner by the beveled points on the coupler face. The draft strain on the drawbar is distributed throughout the

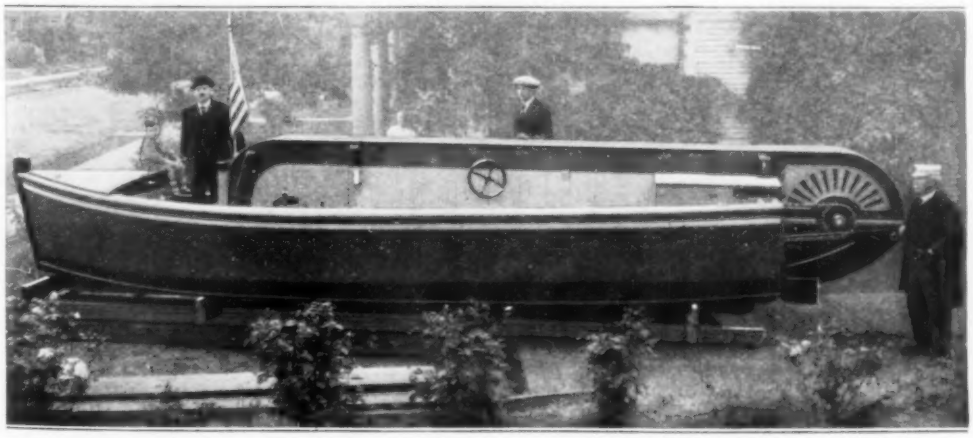


Two Cars Shown Connected with the Automatic Car and Hose Coupler: The Safety Chains are Held Back So as Not to Obstruct the View of the Coupler

head by a system of interlocking lugs. There are provided short hose connections, by means of which the automatic coupler can be used with all makes of standard couplings now in use.

ENDLESS-CHAIN PROPELLER BOAT HAS SHALLOW DRAFT

A novel boat, recently tested on the Willamette River, at Portland, Ore., has a draft of only 6 in. and can run over submerged logs or débris along the bottom without damage to its propelling mechanism. This boat is 29 ft. long and is equipped with a 20-hp. gasoline engine. A 44-ft. chain, carrying 22 blades which measure 12 by 4 in., passes around a sprocket wheel housed at the rear. Power is transmitted to the chain by a shaft through the sprocket wheel. The chain

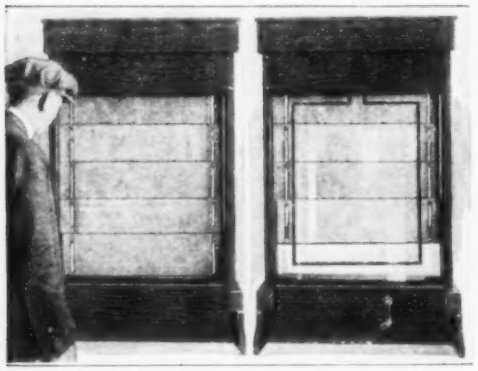


This Odd-Looking Flat-Bottom Boat Has a Draft of Only Six Inches When Normally Loaded. It is Propelled by Blades Attached to an Endless Chain Running through a Housing in the Center of the Hull

is inclosed in a central housing and passes through the bottom of the boat and along a channel formed by a double keel. The keel projects 2 in. below the blades and thoroughly protects them. In tests, this odd craft attained a speed of 16 miles an hour.

STEEL CURTAINS TO MAKE WINDOWS BANDIT-PROOF

Several successful raids, in a western city, by elusive automobile bandits who, in each case, after hurling a brick through a store display window, grabbed thousands of dollars' worth of merchandise and got away with it, led to the production of a means of protection. It consists of a bullet-proof steel curtain, which drops automatically behind the display window, the instant the glass is broken. The curtain is made of a series of narrow, flat steel plates, linked together in much the same manner as in the old Venetian blind. This curtain is on a roller, contained in a box above the window. The roller is magnetically controlled, retaining the curtain in the box by an electric circuit. The moment this circuit is interrupted, the curtain falls automatically. The interruption of the circuit is caused by the cracking of the window pane, which breaks a frame of ribbon foil on the window, in the same manner as is now so common for setting off an electric alarm bell. This old standard alarm can be combined with the new protecting curtain. The appliance can also be used to protect bank tellers' cages.



Models of the Bullet-Proof Steel Curtain That Protects Display Wirdows, Showing at the Right the Ribbon Foil, the Breaking of Which Causes the Curtain to Drop

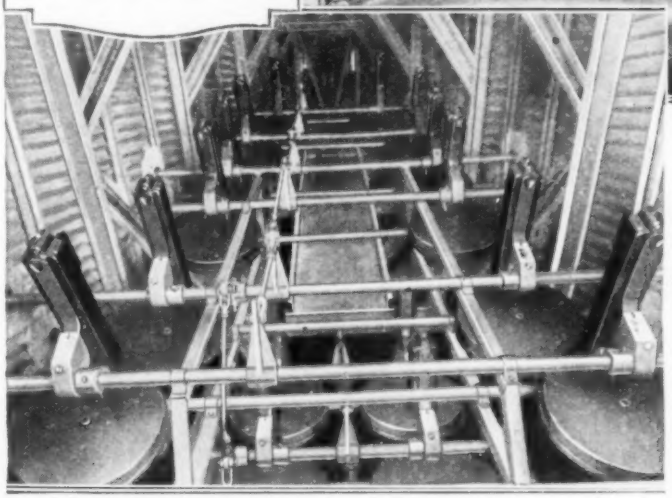
NEW STORY IS BEING ADDED TO U. S. TREASURY BUILDING

During the war, the requirements of the Treasury Department for office space were enormously increased, and temporary buildings were erected to take care of the overflow. Some time ago it was decided to add a story to the present treasury building, which is architecturally one of the conspicuous features of the city of Washington. Already the old roof is being broken through in preparation for the erection of structural-steel members that will form the framework of the new story.

Part of the Roof of the Treasury Building, in Washington, Which is being Broken Through for the Erection of the Structural-Steel Framework of a New Story That is to be Added

ANTI-INFANTRY AIRPLANE CARRIES 30 GUNS

Above Is the New Armored Monoplane being Tested by the Army and Navy as a Weapon for Operations against Infantry. All Vital Parts are Protected from Rifle and Machine-Gun Fire. Being Built for Speed, the Plane Is Comparatively Small, Having a Span of Only 49 Feet and a Length of 32 Feet over All. The Cockpit, with Its Two Extra Machine Guns, Used by the Pilot and a Gunner, is Shown at the Right

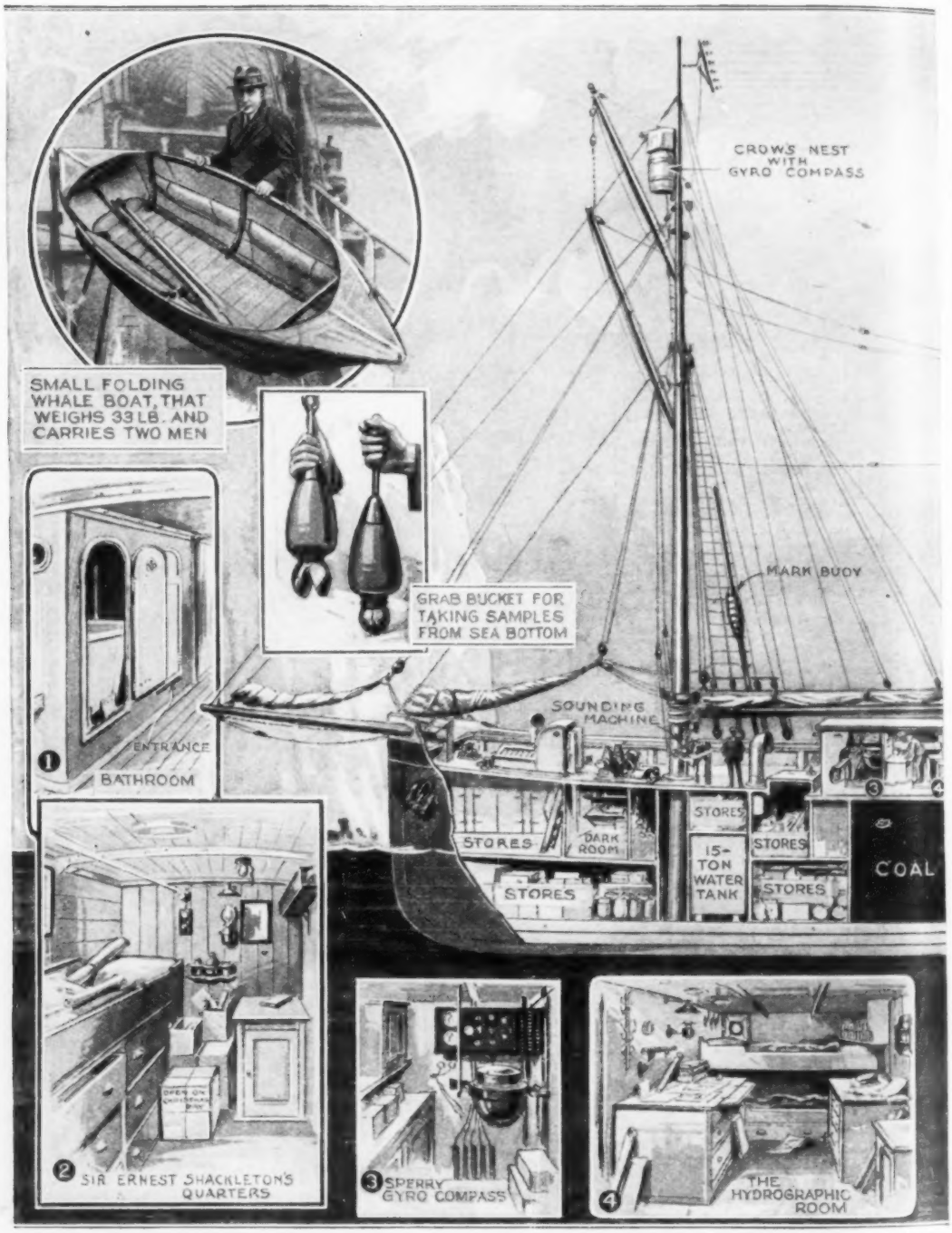


At the Left, an Inside View of the Fuselage Shows the Arrangement and the Method of Mounting the Machine-Gun Batteries So That They may be Fired through the Bottom of the Machine While Flying over Infantry

An armored monoplane mounting 30 machine guns was recently completed and sent to Washington for tests of its practicability by the army and navy. This plane is of the Junker type with cantilever wings and the fuselage built above the wing surface. It has a span of 49 ft., and 32 ft. over-all length. A cruising speed of 141 miles an hour and a radius of 400 miles are claimed for it, equipped with a 400-hp. Liberty motor. The construction is of duralumin, and vital parts are protected with 3/16-in. armor to deflect rifle and machine-gun fire. A main battery of 28 machine guns is carried in the fuselage in two sections, each fired by a lever, or both fired by a master lever. Two additional guns are superimposed on the forward part of the cockpit. The plane was designed to be used in attacking infantry and is said to be easily maneuverable in spite of its size, and capable of climbing 1,000 ft. in 49 seconds.

¶A yellow dye which renders wool mothproof, is a new product of the German chemical industry recently placed upon the European market, according to a consular report.

EQUIPMENT OF SHACKLETON'S ANTARCTIC



THE small sailing ship "Quest," that will carry the Shackleton expedition to the antarctic regions on a 30,000-mile voyage of exploration and research was briefly described in the November Popular Mechanics Magazine. There are now available more particulars of the construction and equipment of this little craft, and they are very interesting. The first thing to strike the eye on an outside view is the crow's nest, slung high up on the mainmast. This is electrically heated, and as the occupant's clothing will be similarly heated, he will be able to do his work in comfort, no matter how cold the atmosphere may be. Among the many ingenious objects packed aboard the little vessel, is a minute seaplane, known as the "Baby Avro," which is slung under the bridge, and which will be very much

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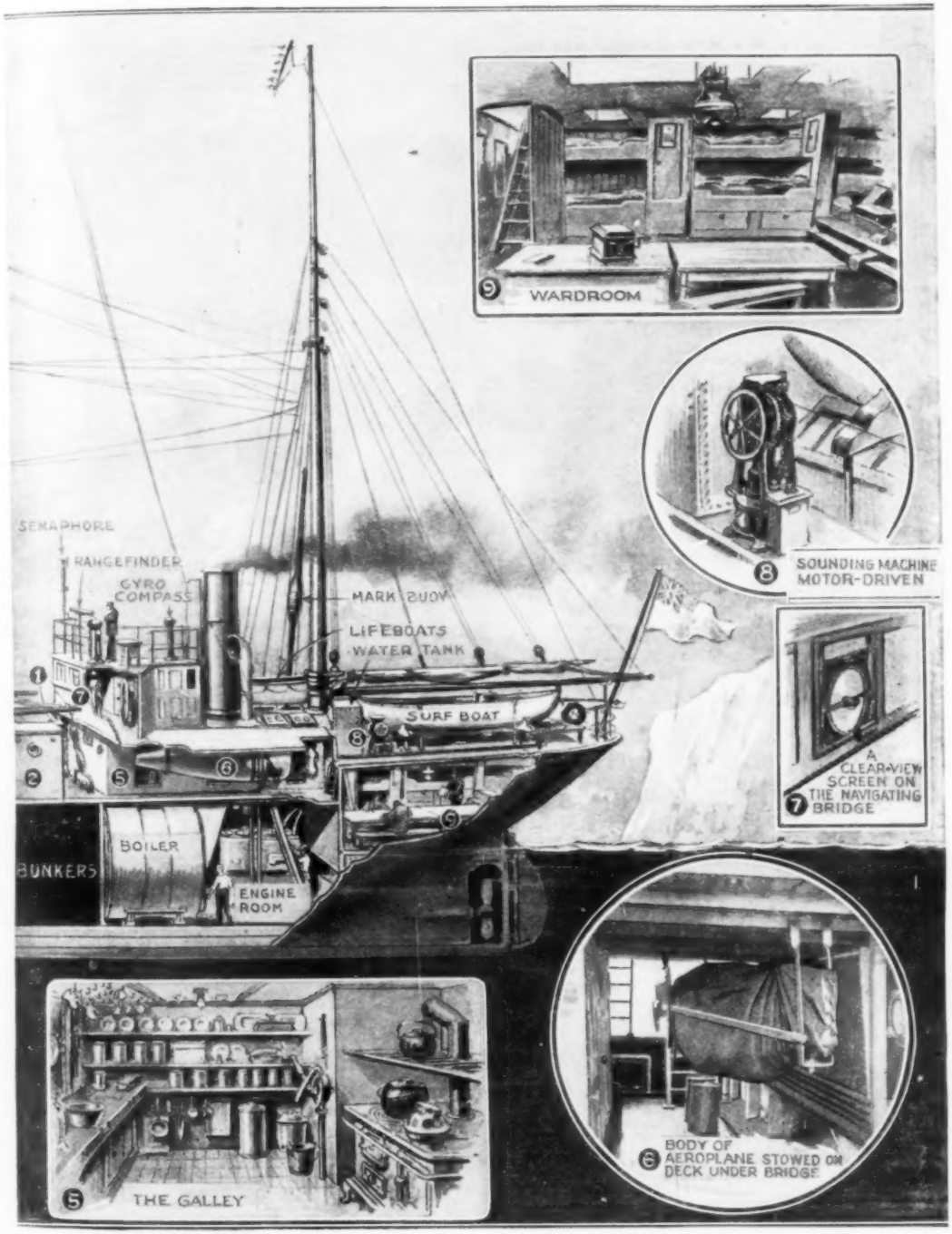
SHIP FITS IT FOR HARDSHIP AND SERVICE

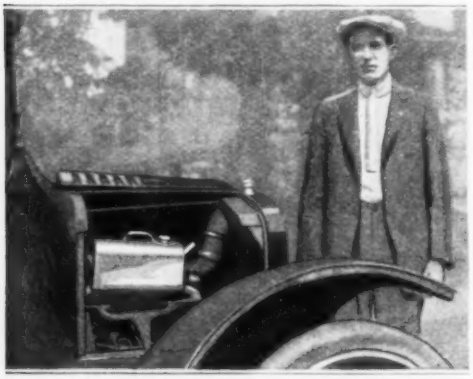


more effective in doing exploration work than the old-time dog trains. On the bridge is a gyro compass, which is nonmagnetic, and depends for its action upon the earth's rotation and the force of gravity, pointing always to the true geographical north. There are two sounding machines, one for stationary work and the other for taking soundings while the ship is in motion. Connected with each is a grab bucket that, when the sinker reaches the bottom, automatically closes and brings up specimens for scientific examination. Besides the lifeboats, there are two feather-weight whalers, of only 33 lb. each. They fold up and occupy very little space. Afloat they accommodate two men, and are given additional buoyancy by means of air bags extending along either side of the canvas hull.

DRAWINGS COPYRIGHT, ILLUSTRATED LONDON NEWS

PRACTICAL COOKING UTENSILS FIT ON AUTOMOBILE EXHAUST

A set of cooking utensils, to fit on the exhaust pipe of his automobile, has been devised by a motor-camping enthusiast



The Hood of the Car is Raised to Show How the Coffee Cooker Fits onto the Exhaust Pipe. This Was the First Utensil Made

of Kansas City, Mo. These utensils proved their practicability on a recent motor trip to Colorado. They were used each day for such purposes as making coffee, boiling eggs and potatoes, and heating water for washing dishes, and shaving. When on the road, a four-mile run was required for boiling, while the same could be accomplished in 15 minutes by running the motor with the car standing still.

GOLF HANDICAPPING DONE BY NOVEL TESTS

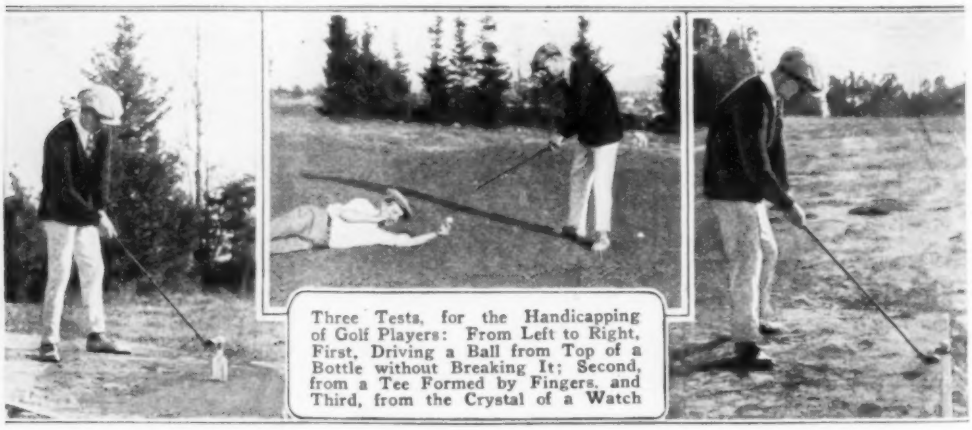
A golf instructor has introduced a new system of determining the ability of an unknown player, where such information is desired for handicapping.

The first test is to drive the ball off the cork of a bottle without breaking or knocking over the bottle. If this is successfully done, the player is given a cheap watch and told to drive the ball from the crystal of the watch without causing the watch to stop. A slight jar would stop the watch, of course, and the fact that a cheap timepiece is used, makes it a matter of little importance if the watch should be smashed. The final test of accuracy is to drive a ball from a tee formed by the fingers of a man lying on the ground. The player must furnish the nervy man who has sufficient confidence in his colleague's ability to make him willing to hold the ball.

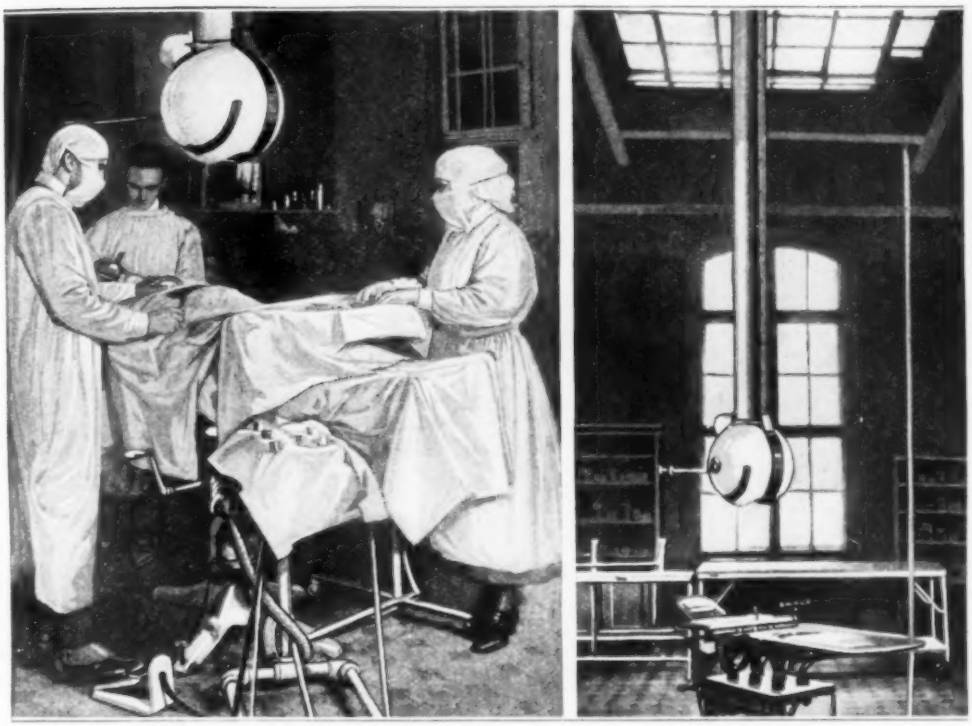
This novel grading system makes it possible for a handicap committee quickly to rate all players in a golf tournament, even though they have never watched any of them in action.

NEW MOVING-PICTURE CAMERA RECORDS OPERATIONS

Moving pictures of surgical operations have heretofore not been completely successful, owing to the liability of one of the surgeons getting in front of the camera. In November, 1916, Popular Mechanics described the method used at the Johns Hopkins Medical School, stating that thousands of feet of film were spoiled for this very reason. A recently developed camera is reported to have overcome this difficulty. The camera, which is of special design, is completely inclosed in a globular metal case, which is located in a tube projecting from the ceiling, directly over the operating table. By means of a motor located outside of the room, the camera may be raised, lowered, or turned at any angle. A telescope at-



Three Tests, for the Handicapping of Golf Players: From Left to Right, First, Driving a Ball from Top of a Bottle without Breaking It; Second, from a Tee Formed by Fingers, and Third, from the Crystal of a Watch



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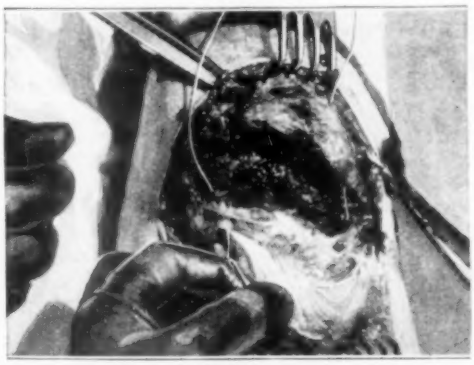
The New Moving-Picture Camera, in Use Photographing an Operation, is Shown at the Left. At the Right Is the Camera and Tube for Suspending It from the Ceiling over the Operating Table

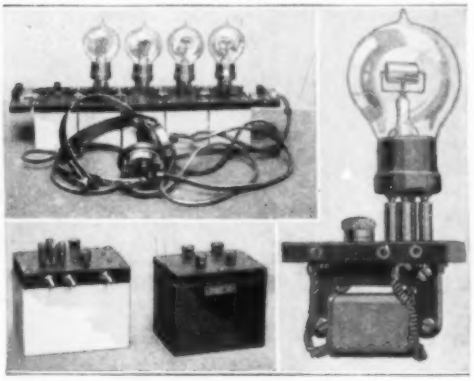
tachment makes it possible to adjust and focus the camera promptly. It has recently been tried out in a Berlin hospital with great success.



Photograph of an Open Wound Made by the Movie Camera While the Surgeon Worked

FRENCH WIRELESS RECEIVER MADE UP OF "RADIO BLOCKS"

The same development which resulted in the standardized-unit radio-receiving outfit in this country, described in the February issue of Popular Mechanics, has produced what is known as the "radio block" in France. These blocks are interchangeable and are provided with three plugs and a binding post, so that they may be coupled in series. There are four units: the high-frequency amplifier, the detector, the low-frequency amplifier, and the telephone block. Combinations otherwise difficult to obtain can be made with radio blocks without danger of error



Upper Left: A Series of "Radio Blocks" Coupled. Below: Two Single Units. At the Right: A Unit with Amplifier Bulb Attached and Covering Removed

STUMPS QUICKLY CLEARED WITH POWER BORER

Throughout the southern states there are millions of acres of land which would be valuable for agriculture if it were not for the expense of clearing it of stumps before it is tillable. All sorts of methods have been used for the purpose, from dynamiting to pulling the stumps out by the roots, but the work has been discouraging at its best. This land may be made available, and the agriculture of the South, as well as other sections of the country, increased enormously, by a simple power stump borer which has been placed on the market. Extensive tests in the South have shown that the machine is entirely practical, and that by its use land can be cleared at a small expense. It consists of an auger mounted on a two-wheeled carriage and operated by a small motor using either gasoline or kerosene as fuel. The auger may be started or stopped at any time, with the motor running, by means of a clutch. It will bore a 2-in. hole through a 3-ft. stump in 30 seconds. The hole is started just above the surface of the ground and bored at a downward angle through the stump. The lower end of the hole is then uncovered with a spade, and when a fire is started the hole acts as a chimney. The entire stump, including the large tap roots, is consumed. Only a small hole is left in the ground and this is partly filled by the ashes from the stump. The slowness and expense of hand boring have practically prohibited this method of burning in the past. The borer is not only valuable in the South where it was tested, but through the northern states where great areas of "cut-over" land need only be cleared in order to be turned into fertile farms. It also offers the opportunity of employment in an entirely new vocation for a large number of men. The original cost and operating expense of the machine are small. A man equipped with one can bore stumps for others on contract, and earn from $10 to $15 a day in this way.

This Stump was Bored and Set Afire. It can be Seen Here How Effectively the Hole Creates a Draft and the Large Roots are Burned Out

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¶For the first time an airship is to be inflated with the noninflammable helium gas, at the U. S. Naval Station at Hampton Roads, Va. The ship, a nonrigid type, will be used to test the lifting power, the valve control, the permeability of airship fabric to the gas, and the methods of handling it.

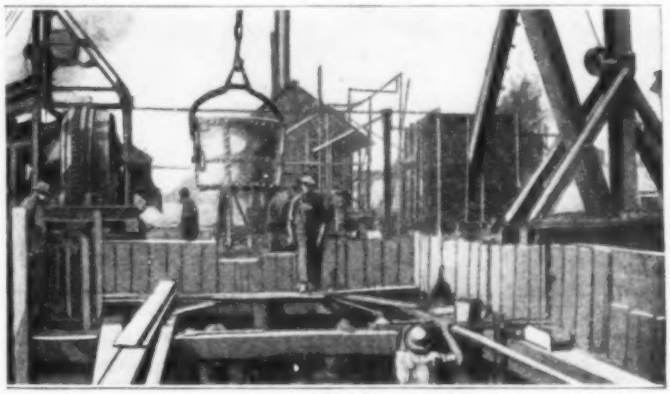
Portable Machine Equipped with a Kerosene Engine for Driving an Auger That Bores a Two-Inch Hole through a Three-Foot Tree Stump in 30 Seconds: The Auger is Started or Stopped at Will by a Lever-Controlled Clutch. The Handle Is Long, So as to Balance the Weight over the Axle

GIANT CHRISTMAS TREE IN YOSEMITE NATIONAL PARK

YOSEMITE NATIONAL PARK is becoming a popular winter resort as well as a summer resort, and each year a great Christmas tree is prepared for the visitors. This tree is said to be the only sequoia, or redwood, used for that purpose. It was planted in 1890 and from a seedling has grown to a height of more than 60 ft. From the point of view of photography, this picture of the giant Christmas tree, with its lights, is of unusual interest. Three separate exposures had to be made of the scene to provide for the different degrees of brilliance.

WORLD'S LARGEST SALT SHAFT NEARING COMPLETION

A salt shaft, said to be the largest in the world, has been sunk at Retsof, N. Y. The shaft is 9 by 28 ft., and contains three elevators by which the vein is reached, 1,000 ft. below the surface. The solid salt vein varies from 10 to 15 ft. in thickness and 50 miles of passageway have already been blasted through it. The operation of the mine is similar to that used in coal mining. Mules haul the salt underground, but the rest of the equipment is of the latest electrical type. When working at full capacity the mine will produce about 3,000 tons of rock salt a day. A railroad and a storage plant are being provided.

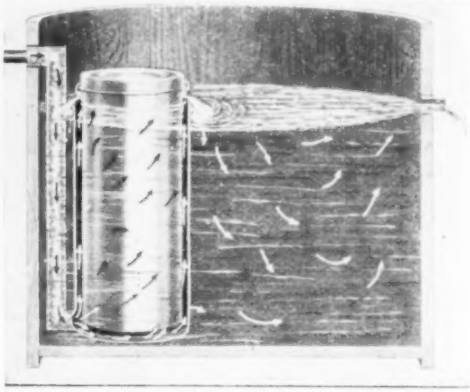


Construction Work on the New 9 by 28-Foot Shaft of a Salt Mine Which will Have a Daily Output of 3,000 Tons

FRESH CREAM IS MADE COLD AND PRESERVED FOR DAYS

Most farmers are so situated that they can deliver their cream to the butter factory only twice a week. This necessitates a means of keeping the cream fresh for two, three, and sometimes four days. Such a means is the subject of a recent invention. In a water tank is an inlet pipe, entering near the top and elbowed down to the bottom, where it connects to a much smaller tank which is open at the top. Into this is placed a somewhat smaller closed can that is filled with the newly separated cream. Cold water flows into the smaller tank, around the cream can, out over the top and into the larger tank, in which it is kept at a suitable level by discharging from a bunghole. After being cooled in this manner, it is placed in storage cans in the water tank.

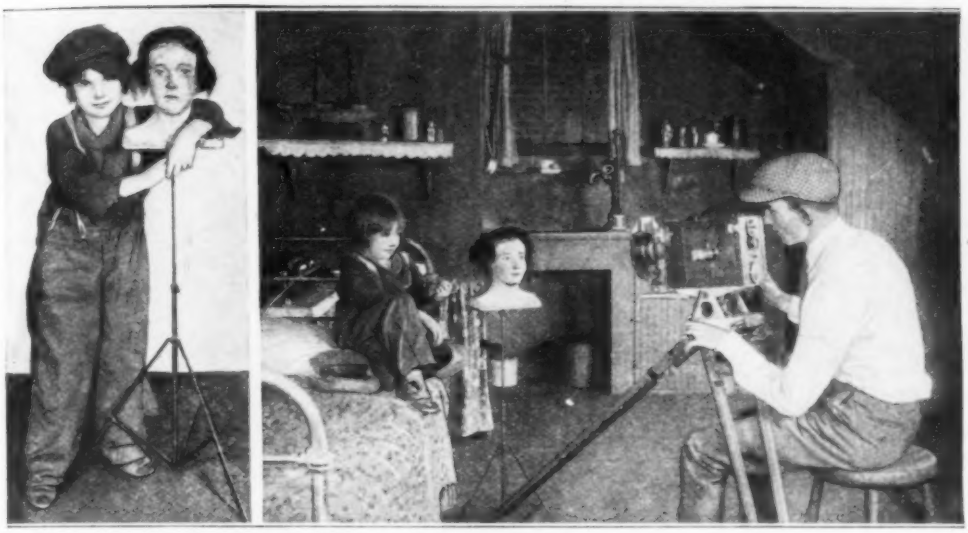
Newly Separated Cream is Cooled in the Closed Can inside the Open Galvanized Tank, and is Then Placed in the Storage Can beside It



The Water Enters the Inlet Pipe, and Follows the Course Indicated by Arrows, Discharging from the Bunghole at the Right. There Is Room Besides for Two Storage Cans

LIFEBOAT RESCUES CREW OF WATERLOGGED JAPANESE SAMPAN

AFTER having floated for 16 days on a waterlogged sampan, with only parts of its deck awash, and most of it under water, ten Japanese fishermen were rescued by the crew of the steamer "Abercos," which was three days out from Yokohama. The Japanese crew had clung for dear life in these perilous circumstances so indomitably that only one had been washed away and drowned. But the others were all in the last stages of exhaustion.



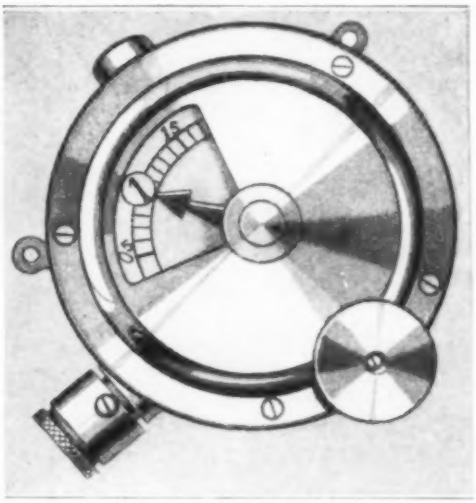
Jackie Coogan and His Dummy "Understudy" are Shown at the Left. At the Right can be Seen the Method of Using the Dummy, Set in Place to Pose for the Little Movie Star While the Camera is being Focused for Interiors

DUMMY POSES TO PROTECT JACKIE COOGAN'S EYES

Jackie Coogan, the diminutive moving-picture star, has an "understudy," which never appears in pictures but renders a valuable service in their preparation. This understudy is merely a dummy, of the same size as the boy. It is posed in his place during the long process of focusing which precedes the actual filming of interior scenes. In this way the youngster's eyes are not subjected to the intense light, used in such scenes, any longer than is necessary.

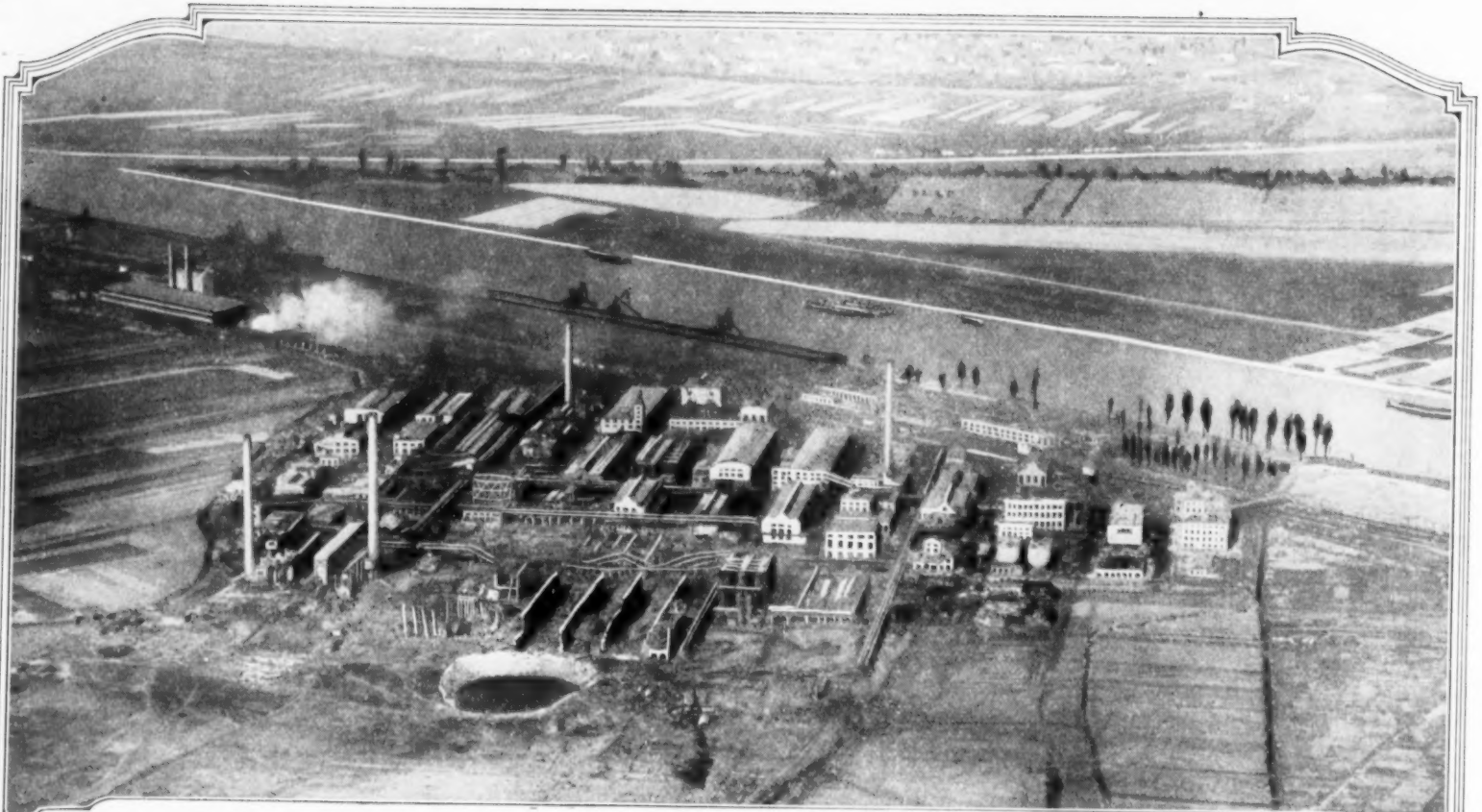
WING-LOAD INDICATOR KEEPS AIRPLANE PILOT IN SAFETY

In maneuvering an airplane, stresses much higher than in straightforward flight may be transmitted to the wings of the plane. These added stresses may result in fracture and disaster. It is therefore of importance that a pilot should have some means of judging how nearly he is approaching these danger stresses. Up to the present he has mostly had to depend upon his experience, but now there is an instrument in the form of a wing-load indicator with which he can tell at any time the degree of safety that exists before the stress limit would be reached. It is clocklike in form, with a diameter of 2¾ in., and is mounted on the instrument board. Its needle points to graduations on its dial that show how much the stresses are in excess of those of normal flight. The highest graduation is 5, which represents the limit of the safety margin, and indicates a breaking stress. It is the pilot's business never to allow the needle to reach this point.



Wing-Load Indicator That Shows the Airplane Pilot How Much Margin of Safety There Is Before the Stresses in the Wings would Reach the Breaking Point

¶ To provide fresh water, a sugar refinery on San Francisco Bay employs a barge of 500,000-gal. capacity. It is loaded by opening seacocks when going upstream, or by wharf connections when docked.



PART OF THE RUINS OF OPPAU AFTER THE DISASTROUS EXPLOSION

THE wreckage, September 21, by explosions, followed by fire, of the great dye works at Oppau, near Ludwigshafen on the Rhine, when several hundred persons were killed and thousands injured, was the greatest disaster of its kind that has ever occurred in Germany, and probably in the world. The entire plant was destroyed, as well as the greater part of the surrounding town. The first explosion occurred at the huge gas holders, and the above picture shows the resulting wreckage in their immediate vicinity. Seismographs at Stuttgart Observatory, some 85 miles away, registered the shock of the first explosion shortly after 7:30 a. m., and a second, more violent one, 22 seconds later. Damages to buildings were reported within a radius of over 50 miles from Oppau.

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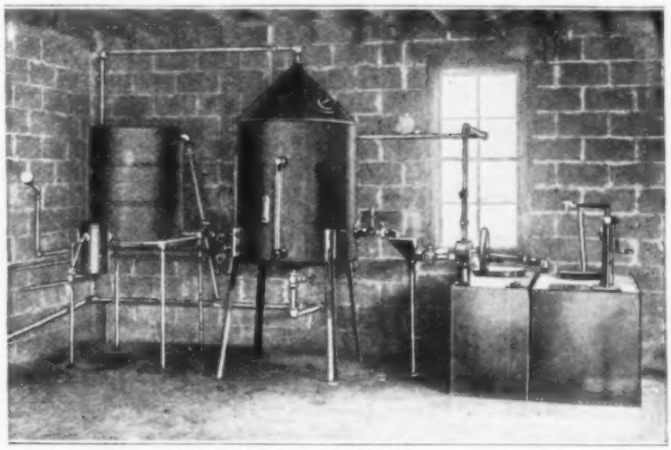
APPARATUS WILL RENEW USED CRANKCASE OIL

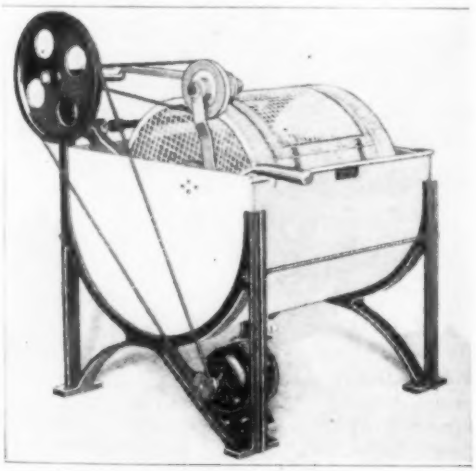
An oil-reclaiming outfit is now on the market, the special purpose of which is to cleanse the used crankcase oil of autos or trucks, so that it can be used over and over again. The essential part of the apparatus is the reclaimer, or still, in the form of a cylindrical tank, which removes all the gasoline and other volatile matter in the oil by the action of steam. All foreign solid matter is removed by precipitation. From the reclaimer the gasoline vapor passes into a condenser beside it, where the vapor is liquefied. On the other side of the reclaimer is first a funnel into which the reclaimed oil is drawn and piped into a tank. Beside this is another smaller tank for the used oil, from which it is pumped into the reclaimer. Actual tests of the apparatus have shown some remarkable results.



Apparatus That Reclaims Used Crankcase Oil: At Center Is the Reclaimer from Which Vaporized Gasoline Passes to Condenser at Left. One of the Two Tanks at Right Holds the Used Oil, the Other the Reclaimed Oil

PHOTOGRAPH WASHER HAS IMPROVED DRIVE

Photographers who do amateur finishing can now obtain a print-washing machine having the entire driving mechanism outside the tank. By a simple arrangement of belt-connected pulleys and countershafts, a small electric motor, mounted on the front leg of the tank, revolves the washing cage by means of a friction pulley that bears against the rim of the cage. The cage is of strong metal mesh with a rim at each end as a bearing surface for the pulley. It can be lifted with a lever for easy access, and prints are placed in it or removed through a door. The capacity of the washer is 200 prints of sizes up to 4 by 5 and postal-card size.



This Print-Washing Machine Does Away with the Difficulty of Leaky Stuffing Boxes by Having the Driving Mechanism Entirely Outside the Tank

LARGEST GERMAN GENERATOR HAS UNUSUAL PROPORTIONS

A 7,000-volt, three-phase generator, rated to produce 60,000 kilovolt-amperes at 1,000 r.p.m., but designed for 50 per cent overspeeding, has been built in Germany. This is, doubtless, one of the largest generators in the world, and some idea of its gigantic proportions may be gathered from the following figures: The cast-iron shell that supports the laminations of the stator weighs 99,000 lb. The laminations have a total weight of 139,700 lb., and the complete weight of the stator is 319,000 lb. The diameter of the rotor is 90 in., and finished it weighs 88,000 lb. It is built up of 26 steel disks, each nearly 4¾ in. thick, which are shrunk upon the shaft. This has a diameter at its largest point of 43 in., and weighs 79,000 lb. It is a hollow shaft with a bore of 11¾ in., and its length over all is a little more than 28 feet.

BRILLIANT ELECTRIC SIGN HAS FEW LIGHTS

Electric signs afford one of the most effective ways of advertising, but their cost and upkeep are often prohibitive.

The Diagram Above Shows How the Light is Reflected on the Letters of the Sign Below

A sign recently tried out with success replaces the individual lamps in the rim of the letter with small mirror reflectors. These reflect the light supplied by two 25-watt lamps, placed near the center of the letter and fitted with opaque caps, so as to be invisible from the front. An old sign can be converted to this economical type by simply replacing the lamps with the small reflectors, which have a screw shank to fit the lamp socket. It is claimed that an arrangement of this kind will save about 80 per cent in lamp renewals and 60 per cent in current.

WHY WE CAN PERCEIVE ONLY FEW COLORS

The sensation of color is due to the effect produced upon the eye by light of some particular wave length or frequency. Thus red, located at one end of the solar spectrum, has a very low frequency, while violet, located at the other end, has a very high frequency. The colors between these two are simply different wave frequencies, which gradually increase from red to violet. It has generally been assumed that the normal human eye could perceive any of these variations. However, experiments have proved that the normal human eye is capable of perceiving only from 16 to 20 distinct colors. Professor Joly, of the University of Dublin, proposes this theory in explanation: When a ray of light reaches the retina, it liberates a quantity of energy, depending upon the frequency of the wave. This energy acts upon the little rods and cones of the retina, causing them to send a stimulus to the brain. Each of the minute rods is connected to the brain by a very slender thread. Each of the cones, however, has a larger connection, consisting possibly of a number of threads. He suggests that when a quantity of energy is liberated, due to a light wave, the rods notify the brain of the presence of light only, without distinction as to color. But the cones, having several lines of communication, can use one or more of these, and thus send a variety of messages, depending on the kind of light received. As the number of combinations is limited, so the number of colors capable of being perceived is limited.

MINIATURE AUTOMOBILE BUILT LIKE A "SCOOTER" TOY

A novel miniature motor car has been built by Allen T. Hanscom, a motor enthusiast of Woonsocket, R. I., for his five-year-old son. In general appearance, it resembles a "scooter," and has three

This Tiny Three-Wheeled Motor Car Is Just Large Enough for the Five-Year-Old Boy for Whom It was Especially Built

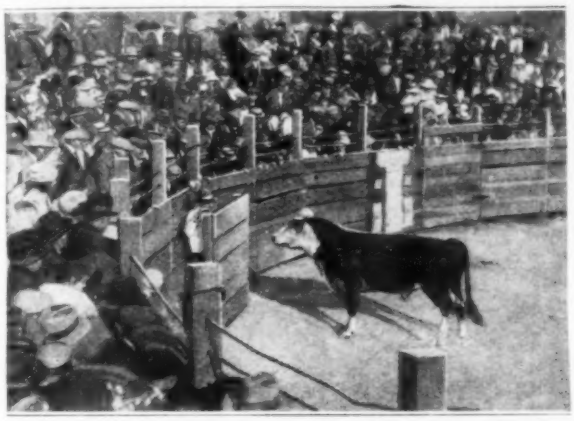
wheels equipped with 15 by ¾-in. tires. In place of the handlebar of a scooter it has a regular automobile steering wheel. Between the two rear wheels is the seat, and the car is supplied with a small horn and a searchlight. It is driven by a 2-hp. gasoline motor, properly geared for varying grades. The control is simple, and the boy has had no difficulty in learning to drive his tiny machine.

HUMANE BULLFIGHT IS NOVEL AFFAIR

By FRANK B. HOWE

A BULLFIGHT, complete and thrilling in all the usual details, yet without cruelty, without revolting features, and without the shedding of a drop of blood! That seeming impossibility was recently staged with complete success in connection with the Mexican Independence Day celebration in Los Angeles, thanks to the inventiveness of a California man.

Matching Wits against the Bull and Exciting Him with a Red Cape



Little Shelters are Provided for the Fighters to Dodge Behind in Case of Extreme Danger

The bullfight was acted exactly as the ordinary Mexican bullfight except that, instead of the usual sharp-pointed blades which are thrust into the animal, blunt prods with a glue-coated base were used. With these sticky weapons the picadors charged the animals in the usual way and thrust their instruments against their bodies. The adhesive base, instead of penetrating the skin, held the lances firmly against the hide, giving the appearance of the reality without hurting the animals in the least.

In this manner, all the skill and excitement of a real bullfight were retained, but the barbarous features were eliminated. Instead of dragging off the dead bulls, they were herded out of a gate, and the crowd went home without the usual sickening impressions of the sight, yet with all the "thrill" that comes from the extreme skill required of the successful toreador.

Above: Sticking on the Glued Prods. Left: Sending the Bull Out of Ring after the Fight

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California has 130 mountains over 13,000 ft. high, and 12 above 14,000 ft., of which at least 60 have never been given names because, amid such a great and varied wealth of mountain scenery, they are not considered sufficiently noteworthy.

GREAT CHICAGO FIRE OF 1871 STARTED THE PUBLIC LIBRARY

The fiftieth anniversary of the great Chicago Fire of 1871, recalls that that disaster was, in a peculiar way, responsible for the establishment of the Chicago Public Library. As an expression of sympathy, the people of England presented a collection of books to the city for library purposes. The action originated with Thomas Hughes, the author of "Tom Brown's School Days," the appeal was signed by many notables, including Queen Victoria, and autographed collections were given by the entire literary world of England. The generous gift was prompted by the mistaken assumption that Chicago had possessed a library which had been destroyed in the fire. As a matter of fact, Chicago had never had a public library and had no legal authority to maintain one. When the books began to arrive, late in 1871—several thousand volumes of them—the city authorities were confronted with the problem of disposing of them. The city was still in ruins, there was no place to put them, and no funds to care for them. A great iron water tank, standing in what is now the heart of the business district, was finally obtained and turned into a shelf room. Steps were taken to secure the enactment of a law, by the Illinois Legislature, enabling municipalities to establish public libraries. The law was passed, and Chicago immediately organized its library with the fine English collection as a beginning.

BY COURTESY OF THE CHICAGO BOOK BULLETIN

An Iron Water Tank, 60 Feet in Diameter, 30 Feet High, and Standing on a 35-Foot Masonry Base, Which had Survived the Fire, was Provided with a Skylight, Bookshelves, and Tables, and This Became the First Chicago Public Library

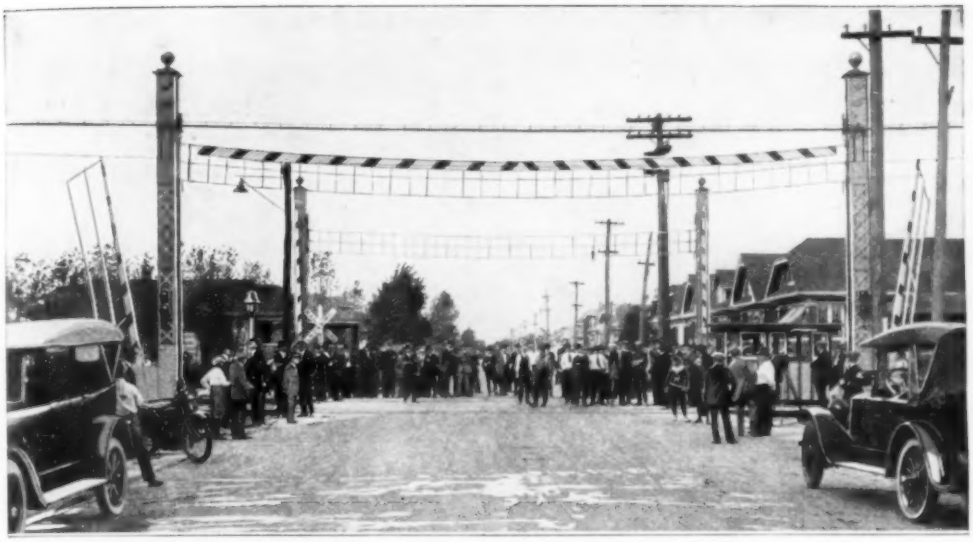
In 1874 the library was moved to more commodious quarters and the original collection of 3,157 volumes, with which it opened on New Year's Day, 1873, has since grown to 1,100,000 volumes.

The First Chicago City Hall, after the Fire of 1871: The Public Library was Started in the Water Tank Which Shows above the Roof

FEWER AUTO-TIRE SIZES WILL CUT MANUFACTURING COSTS

If the recommendation of the Tire and Rim Committee of the Society of Automotive Engineers is adopted, and there is no doubt that it will be, automobile rims will, in the future, be made in only five sizes, and tires in nine sizes, for pleasure cars, and the same number for trucks. By this action three rim sizes and six tire sizes will be eliminated, and two tire sizes, not previously considered standard, will be used. This will effect a reduction in the cost of manufacture, as less money will need to be tied up in machinery and finished products.

¶An electric landing sign marking the aerodrome at Croydon, England, said to be the largest sign in existence, measures a quarter mile in diameter.

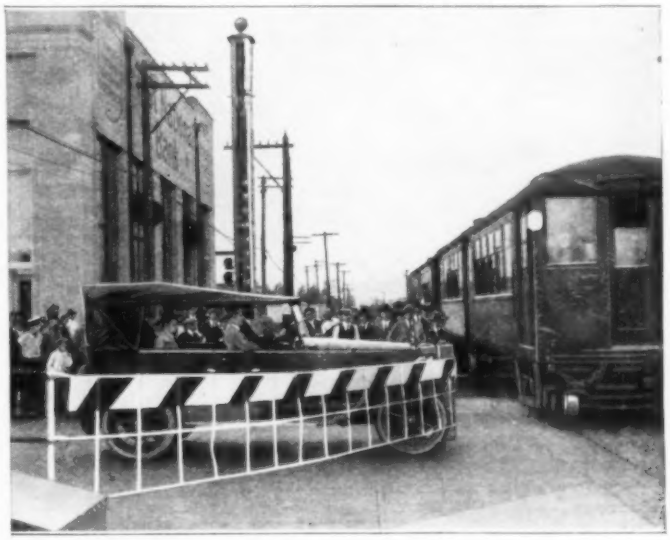


The New Flexible and Extensible Barrier Installed at a Railroad Crossing on Either Side of the Track: When Operative, the Barrier between the Two Posts is Lowered to Block the Traffic

BARRIERS AT GRADE CROSSING SAFEGUARD VEHICLES

A flexible form of barrier for the protection of traffic at bascule and other bridges, and at railroad grade crossings, is now being installed at several points in both the East and the West. The barrier is extensible, as well as flexible, offering a yielding resistance to any moving vehicle that strikes it. This resistance increases gradually until the vehicle is brought to rest, thus acting in much the same manner as a spring buffer. The stoppage occurs at a safe distance from a passing train at a grade crossing, or the end of the road at a bridge opening.

The yielding element consists of three or four horizontal steel cables with vertical spacers at intervals and at each end. Each barrier is stretched between two concrete or steel posts, one on either side of the roadway. The cable network connects by means of a system of endless chains passing over sprockets at the top and bottom of the posts to counterweights within the posts. This connection is made with three chains which pass into the interior of the posts through a sliding head which travels vertically so that, by means of a train of gears driven by a 3-hp. motor, located at the bottom of each post, the barrier can be raised when the road is clear, or lowered to block the traffic. The chains that run through the sliding head allow the barrier to be extended when struck by a vehicle, and the counterweight is then raised to the top of the post, where it is stopped by a U-shaped brake. For ordinary blows the counterweight will suffice to check the movement, and heavy blows are checked by the brake.

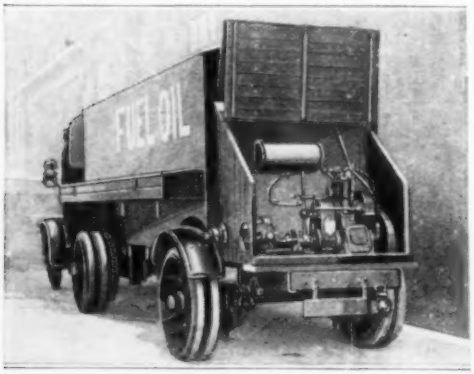


Yielding Barrier Shown in the Act of Stopping an Automobile That was Traveling at Considerable Speed

The Oil Tank Mounted on the Trailer Portion of a Six-Wheeled Truck Unit, for Transporting Heavy Oils: The Mounting is So Arranged That the Truck can be Turned in an Even Smaller Radius Than Indicated by This Illustration. The Dropped Frame Gives the Unit Stability

NEW OIL TRUCK CARRIES TANK ON TRAILER

An unusual type of tank truck is being built in England for hauling heavy fuel oil. The tank is mounted on the trailer portion of a six-wheeled truck unit and



A Two-Cylinder Marine-Type Engine is Placed at the Rear of the Oil Truck to Operate a Gear Pump for Filling the Tank

is supported by a massive steel frame. This frame is dropped behind the turntable to give a low center of gravity. Welded steel plate is used in the construction of the 2,000-gal. tank, and two baffles are so placed inside as to permit the oil to flow under them. This construction is employed to resist the great stresses which are caused by the surging of heavy oil when the truck is in motion. At the rear an engine is carried, on an extension of the frame, to operate a gear pump, with teeth so formed as not to take up an excessive amount of oil. Unless a certain amount of slip is allowed, the viscosity of the fuel oil will stall the engine or break the pump. The engine has a direct drive and a 20-per-cent reduction on reverse. In loading oil from tank cars, which is cold and highly viscous, the reverse is used. The oil in the truck tank is warmed by means of the exhaust.

COMBINED KNIFE AND SAW USEFUL IMPLEMENT

A saw blade attached to the back of a butcher knife should prove a very useful arrangement. The saw blade is slightly thicker than the knife, to prevent binding, and has curved slots at either

The Saw Blade is Held Tightly against the Back of the Knife by a Thumbscrew, Placed at the Hilt of the Knife

end, by which it can be securely drawn against the knife.

¶ World's-series baseball games were reported to fans, sick in the Roosevelt Hospital, New York City, in a novel manner. A code was devised to signal the reports by means of the bell system used to summon doctors and nurses.

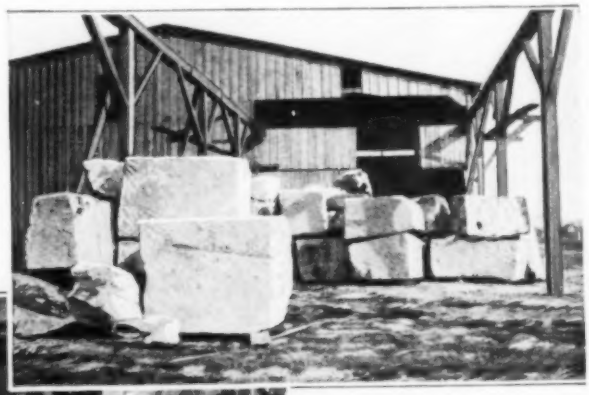
TUFA, VOLCANIC-ASH ROCK, IS HANDLED LIKE LUMBER

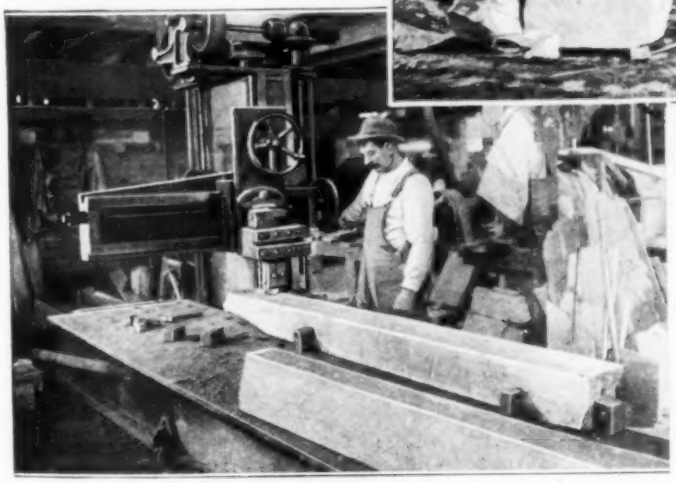
By HORACE E. THOMAS

TUFA, a volcanic-ash rock, with properties possessed by no other stone, is being quarried near the town of Mount Angel, Ore., the only place in the United States where it has been found in sufficient quantities for commercial use. Deposits in Italy and Germany have been used for building purposes for many years, but the Oregon tufa is lighter than the European, and has other special characteristics. The stone is first blasted out and is then hauled to a mill and handled like lumber. It is cut into blocks or "boards" of any desired dimensions. Saws, planers, and drills are used on it exactly as in a lumber or planing mill. The finished product closely resembles lumber, but is cut only in short lengths. It is a light-gray color, with spots of white running through it, and weighs only 80 lb. to the cubic foot, about one-half the weight of common building stone.

The Quarry Where Tufa is Blasted from a Bed, 15 to 35 Feet Deep, Covering More Than 1,000 Acres: This Part of the Work Is Similar to the Quarrying of Ordinary Stone, Though from Here on It is Handled in the Same Way as Lumber

A peculiar characteristic of the Oregon tufa is that it can be nailed. Nails are driven into it as easily as into oak and other hardwoods, but are harder to pull out. Tufa furniture, nailed together, has been made experimentally. It is regularly used for fence posts, moldings, sills, and many other purposes where nailing is required. Recently it has been discovered that when pulverized it makes a soft, velvety powder which is an excellent filler for rubber. It is predicted that it will supplant all other materials for this purpose, thus utilizing the refuse.

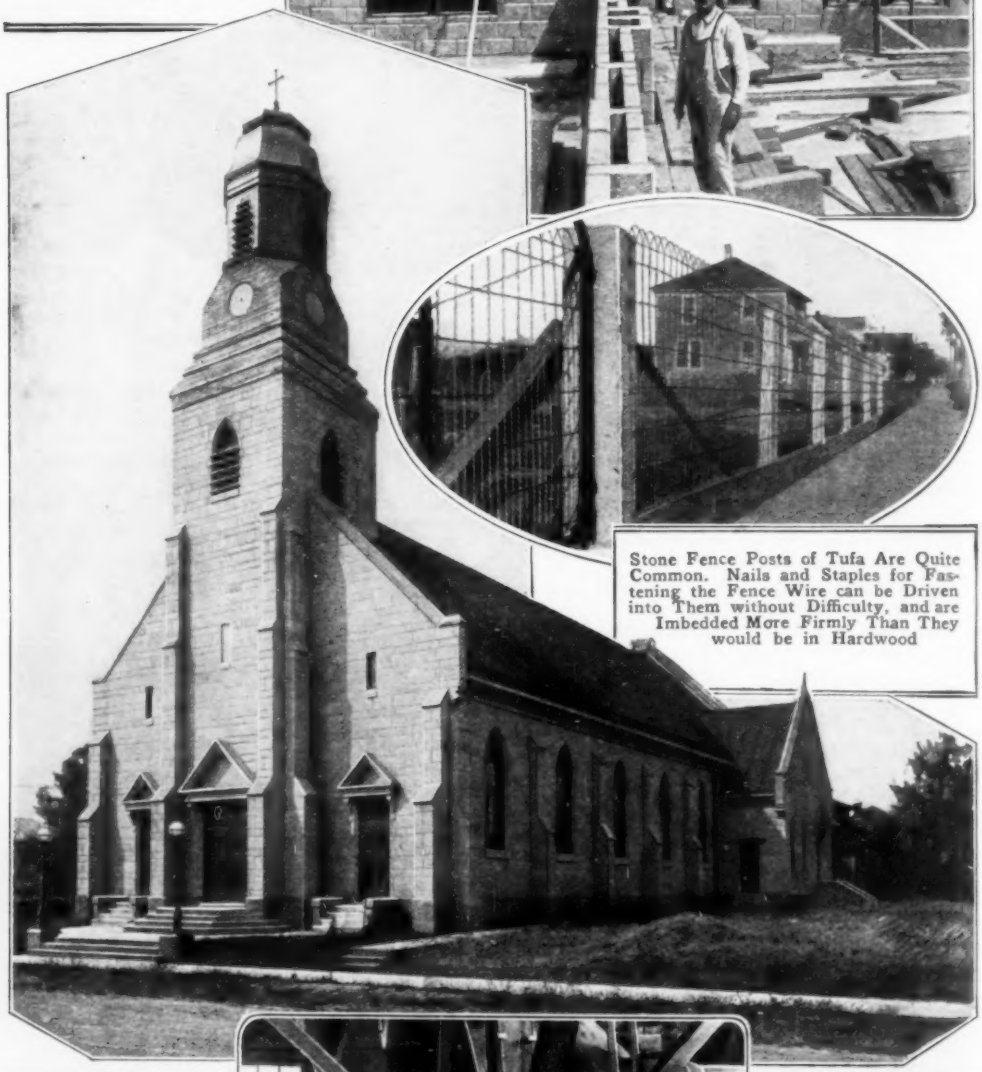




Tufa Arrives at the Sawmill in Great Chunks, like Those Shown in the Upper View. Below Is a Scene in the Mill. Here Window Sills, Made of the Solid Rock, are being Planed in the Same Way as Lumber

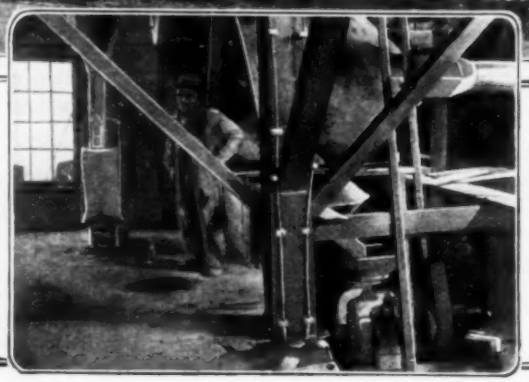
The Mount Angel tufa field lies at an elevation of 1,500 ft. and covers an area of over 1,000 acres,

At the Right a Building of Tufa is Shown under Construction. The Method of Laying the Blocks to Form a Hollow-Wall Structure, Similar to That of Building Tile, can be Seen Clearly



Stone Fence Posts of Tufa Are Quite Common. Nails and Staples for Fastening the Fence Wire can be Driven into Them without Difficulty, and are Imbedded More Firmly Than They would be in Hardwood

Above Is a Church Built Entirely of This Peculiar Stone. The Light-Gray Color, with Spots of White Running through It, Makes a Building of Pleasing and Artistic Appearance, While the Ease with Which It is Handled Materially Simplifies the Construction



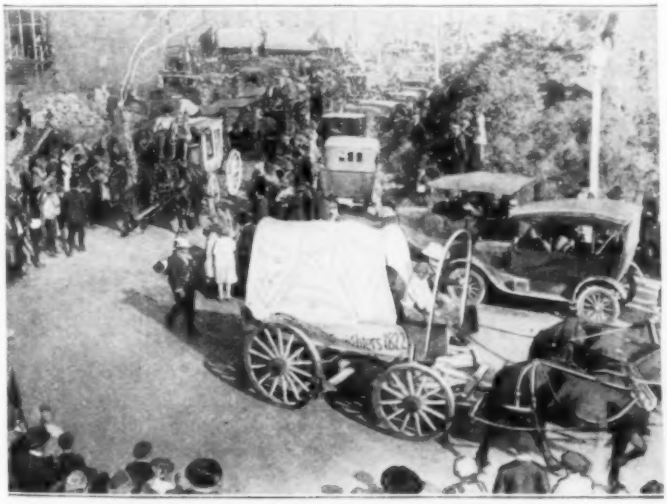
Refuse from the Mill, Where the Tufa is Sawed into Various Forms, is Ground into a Soft, Velvety Powder and Sacked. This Powder has Proved to Be an Excellent Filler for the Manufacture of Rubber. It is Said to Be Superior to All Other Rubber Fillers

varying from 15 to 35 ft. in depth. It is covered with a layer of earth and basaltic rock. This peculiar stone is composed of pure volcanic ash, free from lava, which was thrown up by some early volcanic disturbance and solidified during the course of ages. The charred remains of trees are found imbedded in the rock, erect as they were when the ash fell about them. The source of the ash cannot be determined, though it is suggested that it may have accompanied the eruption which formed the bed of Crater Lake in Oregon.

Another Scene in the Tufa "Lumber" Mill: Here the Stone is being Cut into Timbers, for Building Construction, by Means of a Carborundum Wheel, Used in the Same Way as a Circular Saw. This Machine Shows the Greatest Variation from the Lumber-Mill Type Equipment

MISSOURI CENTENNIAL DEPICTS OLD TIMES

In celebration of the 100th anniversary of the admission of Missouri to the Union, a large parade and pageant were recently held in Kansas City. Over 30,000 persons saw the pageant, which depicted scenes from the history of the state. Children representing every school in the city marched in the parade and took part in the pageant. A feature of the parade was 20 auto loads of wounded soldiers. Many of the old prairie schooners and stagecoaches were also seen. The parade was headed by the Boy Scouts, who proved efficient in handling the crowds.



A Feature of the Missouri Centennial Parade, at Kansas City, Was the "Evolution of Transportation." Two of the Stages may be Seen Here, the Prairie Schooner in the Foreground, and the Stagecoach at the Left

SWEDISH INVENTION MAKES TALKING MOVIES POSSIBLE

Though "speaking films" were first made about 1900, their combination with picture films has just been successfully accomplished for the first time, by two Swedish scientists, and the talking movie seems about to become a reality. The method is closely related to telephony by light, and is said to employ the fundamental method of earlier developments, which makes use of the property of selenium for controlling a telephonic current when actuated by variable illumination. The novelty of this latest work seems to be in the successful combining of picture-bearing and sound-record-bearing films by running them on the same shaft, while taking and reproducing the double record, and in making selenium-controlled electric currents operate a loud-speaking telephone.

SMALL RUNWAY HELPS AUTO OVER CURBING

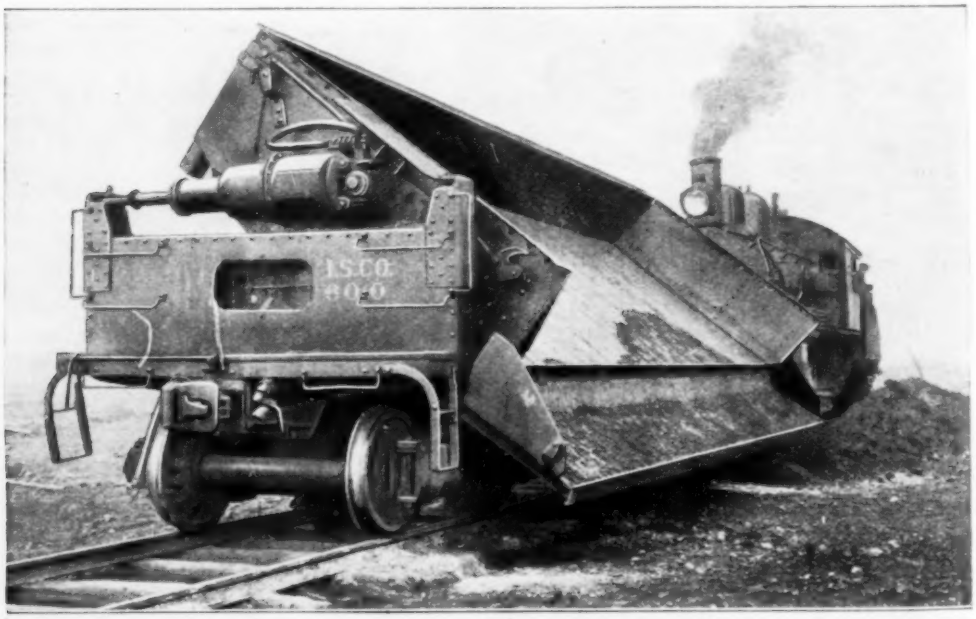
To do away with the often occurring necessity of running up over the curb to get into a garage or parking space, a

The Manner in Which the Portable Runway is Placed for Use: The Insert Shows Runway Folded in Middle, Which Permits It to be Carried in Car

Rhode Island man has invented a small portable runway. It consists of two wooden runs, connected by a strip of wood hinged at the middle to permit folding. The device weighs only 10 lb., and when folded is only 3 ft. long.

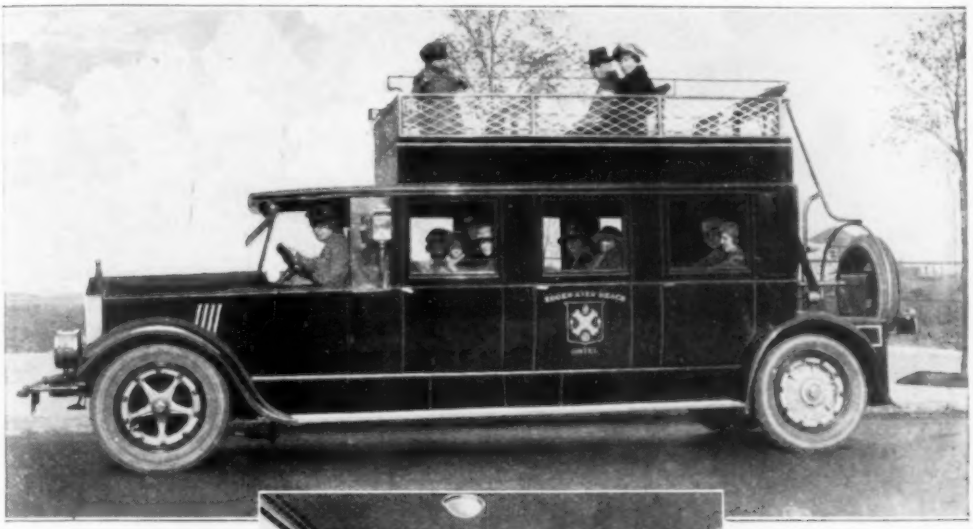
COMPACT AIR-DUMP CAR WITH EXTENSION SIDE

Of the many forms of dumping cars, few are so compact, and so devoid of top-heaviness, as a newly patented dump car that is operated pneumatically. The dumping portion of the car is pivoted on a frame that supports it on the wheel trucks. To one corner of this frame is connected the piston rod of an air cylinder, which is hinged on the dumping portion. There is one of these cylinders at each end of the car, pointed in opposite directions, one doing the dumping, while the other rights the car after it is unloaded. All that is necessary is to open a valve admitting air to the cylinder, which not only tips the dumping portion of the car, but also unlocks it. In righting the car, this process is reversed by the other cylinder, which then relocks it. At the end of the dumping process, the lower side of the car opens automatically, and remains extended so as to form an apron with its lower edge directing all the dumped material well clear of the track. The dump clears the ties as well as the rail, permitting the car to pass.



Compact Air-Dump Car with an Extension Side That Opens Out as Shown: The Car has been Pushed Forward, after Dumping, and It can be Seen That the Material has Fallen Some Distance from the Track

HOTEL BUS SERVICE HEIGHT OF COMFORT AND LUXURY



Above: One of the Busses Provided for the Guests of an Outlying Chicago Hotel, to Carry Them to the Business and Shopping District.

These Busses Represents Below: The Interior of the Height of Everything That Makes for Comfort and Luxury in Automobile Body Design

The specially built busses, operated by an outlying Chicago hotel, to meet the transportation problem for its guests, represent the height of luxury in motor design. A standard truck chassis is equipped with a hood, running board, and so forth, of the pleasure-car type. The body is of the limousine style and is finished in dark green with black and yellow trimmings. Limousine doors give entrance on the right side, and, to prevent accidents, are operated electrically by the driver. The interior seats are arranged in sections, four passengers to a seat, all facing forward. They are upholstered in the finest gray mohair and are trimmed in pillow style to insure cleanliness. A roof deck is provided with seats having comfortable curved backs, deep seat parts, and ample knee space between. At the rear, a winding stair, with brass railings, leads to the top, which is inclosed with a nautical rope effect, adding an appearance of lowness to the lines of the machines.

EARTHQUAKES RECORDED PHOTOGRAPHICALLY

An improvement in the seismograph—the instrument used for recording earthquake shocks—has been accomplished by the use of light-sensitive paper in place of the ordinary paper upon which the record is marked by a stylus or pen. A small mirror adjusted to record any earth movement by oscillations, receives a beam of light and reflects it onto the strip of sensitive paper. This reflected beam of light moves through an angle which is twice that of the angular motion of the mirror, and therefore the record of the oscillations on the paper is enlarged twofold. The recording paper, as in all such instruments, moves constantly, and registers the time and period of the oscillations.

¶An ordinary locomotive, driven by superheated steam, has satisfactorily replaced the rack system on gradients as high as 60 ft. in 1,000 on the line between Halberstadt and Blankenburg, in the Harz Mountains, Germany, and is to be tried on 80 in 1,000 gradients.

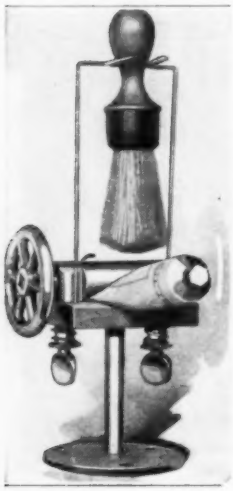
LARGEST BOMB IN WORLD MAKES HUGE CRATER

What is believed to be the largest aerial bomb ever made was tested recently by ordnance officials at the Aberdeen, Md., proving grounds. It had a total weight of 4,300 lb., was about 14 ft. long and 2 ft. in diameter, and contained 2,580 lb. of T. N. T. It was dropped by a Handley Page bomber from an altitude of 4,100 ft., hitting within the area marked off on the ground, and making a crater 100 ft. in diameter and 30 ft. deep. The bomb was colored red, with a yellow tail, to enable the observers to study its motion.

PHOTO BY GILLIAMS SERVICE

This Crater, Made by the Largest Aerial Bomb Ever Exploded, Was 30 Feet Deep and 100 Feet in Diameter

SHAVING-TUBE SQUEEZER SAVES CREAM



A shaving-tube squeezer, consisting of a roller mounted by spring tension on a small stand, is the latest addition to the shaver's equipment. By simply turning the small handwheel on the end of the roller, the proper amount of cream can be squeezed out. A wire holder attached to the stand for the brush keeps it from being misplaced.

GAS-TURBINE DEVELOPMENT REMAINS EXPERIMENTAL

For many years it has been prophesied that turbines actuated by hot gases other than steam would be the ideal prime mover of the future. But in spite of countless attempts to perfect such a machine, there are very few that have shown any promise of surpassing even the reciprocating motor in efficiency. One of the latest attempts to develop a turbine utilizing directly the energy of hot gases is the result of the work of a German engineer, which began before the war, and which has been continued since the war with sufficient promise to encourage its promoters to believe that they may ultimately develop a prime mover that in efficiency will perhaps never equal the steam turbine, but will at least surpass the reciprocating gas engine. At Mulheim, in Germany, two experimental models have been built, which have functioned with success, but not quite well enough to show much prospect of ever competing with the steam turbine. These experimental machines are of 500 hp. each, one for using gas and the other for oil.

UNITED STATES NAVY ADOPTS A NEW FLAGSHIP POLICY

In the naval fleets of all countries it has been customary to use one of the largest and most powerful of the battleships in the fleet as the admiral's flagship. A new policy is about to be adopted in the U. S. Navy, and when Admiral Hilary P. Jones takes command at the next joint mobilization of the Atlantic and Pacific fleets, he will use the "Great Northern" as the flagship. The special features of this ship are not those of a capital battleship, but speed and commodiousness. It is an oil burner with a speed of 29 miles an hour. The idea is that an admiral in command of a fleet can control it more effectively from a fast ship.

¶A new civic center will be established in one of the most dilapidated sections of the city of Baltimore. It is to be improved with a group of buildings, of which the first unit will be a Memorial Hall. This will be in the style of a Greek temple, covering an area of 110 by 180 feet.

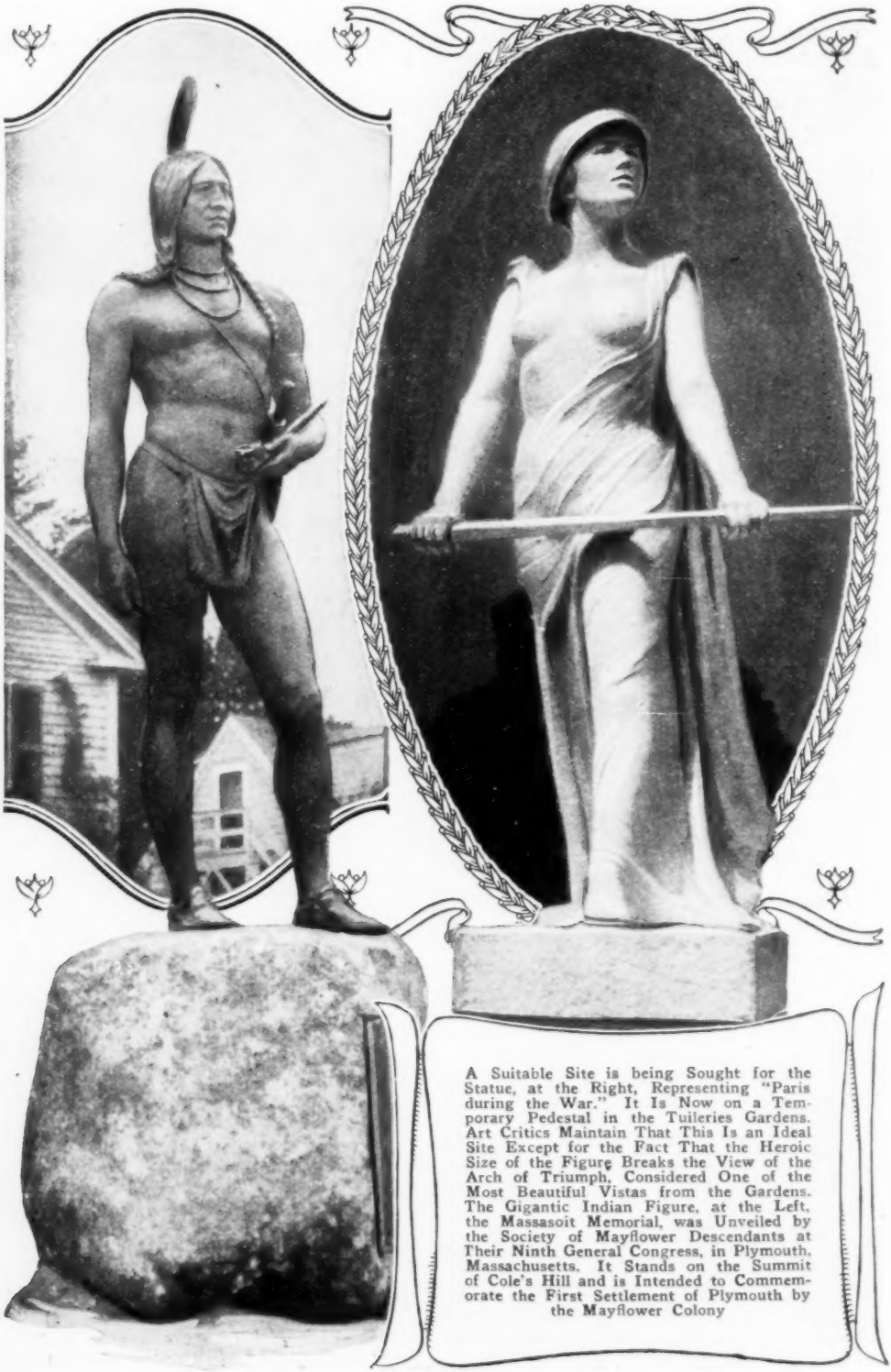
IGNITION OF OIL TANK DURING FLOOD SETS RIVER AFIRE

THERE is only one way that a river can be set on fire; that is, by the ignition of a mass of oil floating on its surface. A spectacular instance of these conditions occurred recently on a mid-western railway where it crossed a flooded river. While a train of oil-tank cars was passing slowly through the water, the oil in one of them, in some manner, became ignited. The result was that 17 tanks of oil and gasoline were wrecked, and the oil floated, in flames accompanied by heavy clouds of smoke, far down the river.

EIGHTEEN CARS PILED UP IN FREIGHT WRECK

A bad freight wreck recently occurred in Delaware, Okla., a small town near the Kansas boundary. The train was going at about 25 miles an hour, when the front trucks of one of the cars came loose. This hurled it against the station, piling up the remainder of the train, 18 cars, in a heap. Although the cars were very badly smashed up, fortunately no one was injured.

Wreck of a Freight Train at Delaware, Oklahoma, Which Collided with the Station Building Seen Above, and Piled Up 18 Cars, as Seen to the Left: In Spite of the Extent of the Wreck, No One was Injured



A Suitable Site is being Sought for the Statue, at the Right, Representing "Paris during the War." It Is Now on a Temporary Pedestal in the Tuileries Gardens. Art Critics Maintain That This Is an Ideal Site Except for the Fact That the Heroic Size of the Figure Breaks the View of the Arch of Triumph, Considered One of the Most Beautiful Vistas from the Gardens. The Gigantic Indian Figure, at the Left, the Massasoit Memorial, was Unveiled by the Society of Mayflower Descendants at Their Ninth General Congress, in Plymouth, Massachusetts. It Stands on the Summit of Cole's Hill and is Intended to Commemorate the First Settlement of Plymouth by the Mayflower Colony

COMMEMORATED IN PERMANENT SCULPTURE

This Bust of Cardinal Mercier, One of the Most Heroic Figures in Belgium's War Record, is to be Placed in the Gould Memorial Library of New York University. It will be Unveiled by the Belgian Ambassador

The Sixth Centenary of the Death of Dante is being Observed throughout the World. This Bust of the Great Italian Poet, on a Marble Pedestal Overlooking the Hudson River at Newburgh, New York, was Unveiled on October 12. The Inscription for the Monument was Written by Dr. Lyman Abbott, the Noted Preacher, Editor, and Author

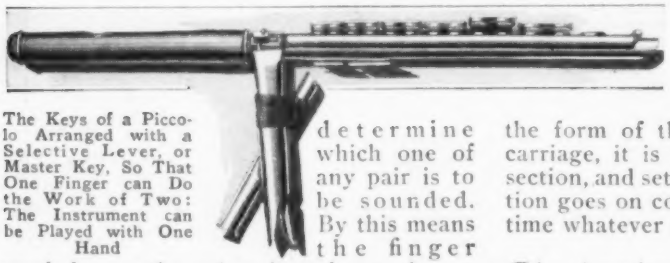
A Monument to Georges Clemenceau, Unveiled on His Eightieth Birthday, Stands in His Childhood Home, at Sainte Hermine. It Represents the French War Premier on the French Front Surrounded by a Number of Poilus. While This Is a Rear View of the Work, It Affords an Excellent Idea of the Group

ONE-HANDED MUSICIANS AIDED BY NEW DEVICE

Maimed to the extent of the absence of only one finger, a musician could not play the old form of saxophone or piccolo and

Musician Using a Device That Enables Him to Play the Saxophone with His Left Hand and a String Tied to His Crippled Right Arm

allied instruments. Now there is a new form of these instruments that can be played by a cripple with only one arm. A scale of 36 notes can be played on a saxophone or a piccolo with one hand and a string tied to the foot, or to the stump of the missing arm. The device can be applied to any existing instrument, and the register or octave key can then be dispensed with. It operates by dividing the scale into semitones, a pair of such notes being apportioned to each finger, with a selective lever or master key, common to all of the pairs and adapted to



The Keys of a Piccolo Arranged with a Selective Lever, or Master Key, So That One Finger can Do the Work of Two: The Instrument can be Played with One Hand

determine which one of any pair is to be sounded. By this means the finger work is greatly reduced, and yet gives a chromatic scale of two octaves. The device is made in several forms which are adapted to be applied to the saxophone, the piccolo, flute, oboe, and similar instruments.

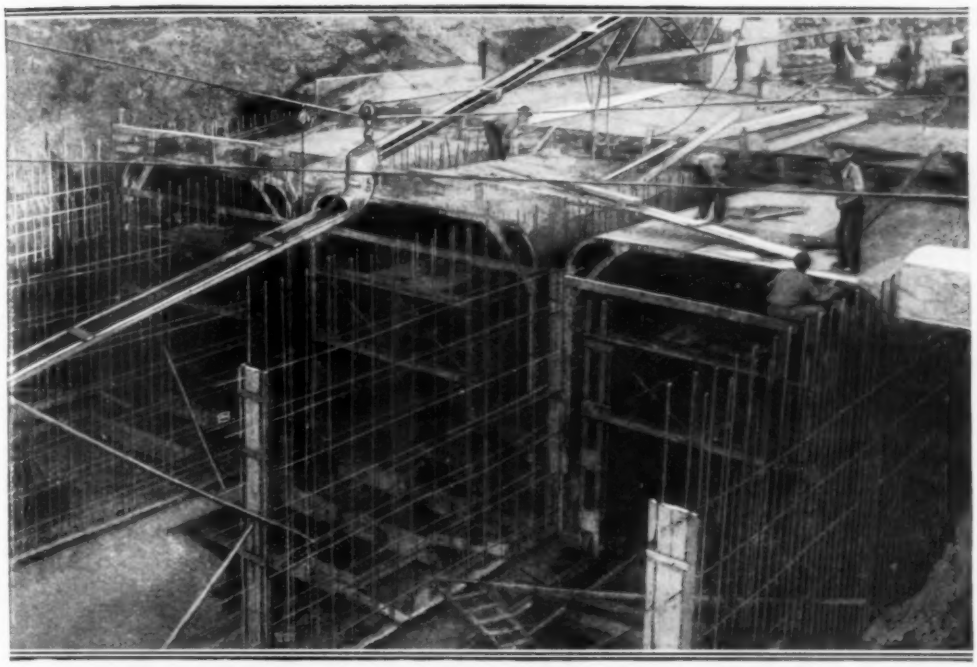
CATAPULT LAUNCHES AIRPLANE FROM BATTLESHIP

Catapults of various kinds have been built in the past 10 years in the attempt to devise a satisfactory means of launching airplanes from battleships. The development of a device, by the navy, which operates on the catapult principle and which is expected to meet all requirements, has just been announced. It consists of a carriage, moving on tracks, on which the plane is mounted. The carriage moves forward at increasing speed until it acquires sufficient velocity for the airplane to rise. At the end of the track the carriage is brought to rest by brakes and shock absorbers. This device is to be thoroughly tested and, if it meets expectations, it can be built into all battleships quickly, and in such a way that it will not interfere with gun turrets and other equipment, as have most previous devices.

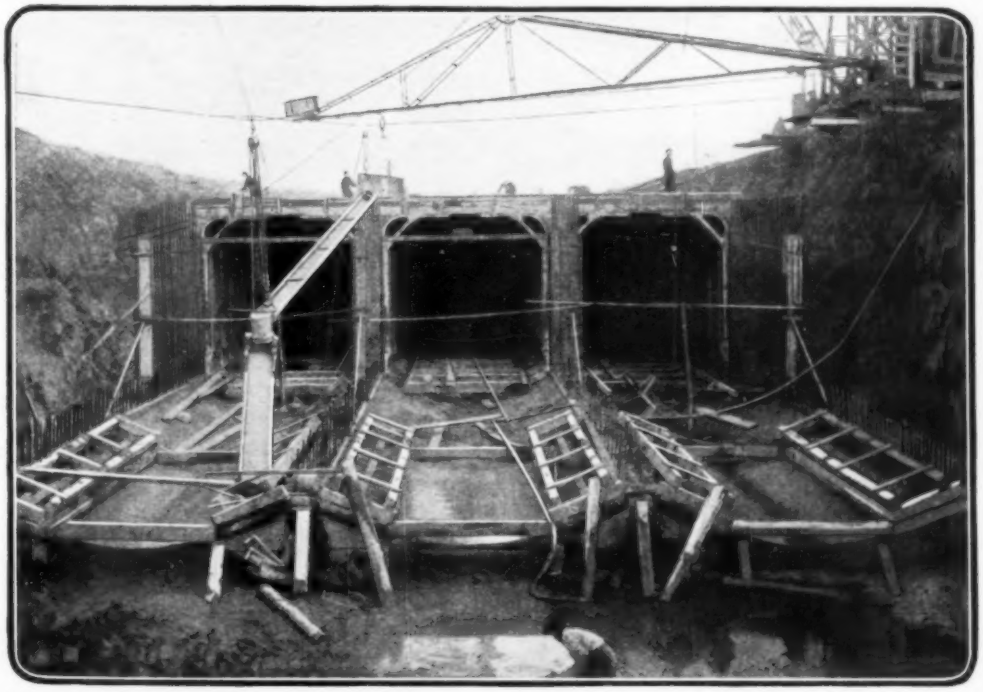
COLLAPSIBLE STEEL FORMS FOR GIGANTIC SEWER

In an open-cut sewer, now being built in Detroit, there are two remarkable features—one is its great size, and the other is the use of a novel kind of collapsible steel form for pouring the concrete. In size it is said to be one of the largest sewers in the world, and together with another similar one, known as the Lonyo Road sewer, will have capacity enough for a future population of 3,000,000 or more. It is composed of three adjacent tunnels, each with inside dimensions of 17 ft. high by 15 ft. 9 in. wide. The steel forms are in sections 20 ft. long. They are so constructed that after the concrete is poured, and has had time to set, the forms can be collapsed onto a steel carriage that runs on rails. While the first section is setting, a second one is poured, which takes about the same time as the setting of the first section, so that when the form of the first is collapsed on its carriage, it is pulled through the second section, and set up beyond it. This alternation goes on continuously, and there is no time whatever expended in erecting forms.

¶An American, seeking a Paris, France, apartment, for the winter, employed an airplane and pilot to drop 100,000 cards over the principal boulevards. The cards stated his needs and, it is said, he received 200 replies.



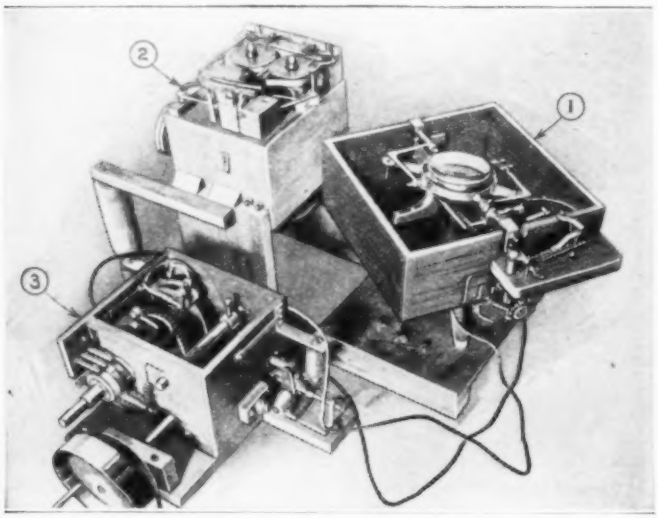
Partitioned Open-Cut Sewer Composed of Three Adjacent Concrete Tunnels Built with Collapsible Steel Forms in Sections 20 Feet Long: One Form Is Sufficiently Collapsible to Allow It to be Withdrawn on the Carriage, Seen on Wheels, from a Section in Which the Concrete has Had Time to Set through a Second Section in Which the Concrete is Setting. It is Now being Prepared to Form Another Section of the Tunnel. Note the Bars Already Set for Reinforcing the Concrete of the Partitions and Outside Walls. When the Forms are Expanded into Proper Position the Concrete will be Poured in This Section of the Three Tunnels



Triple Concrete Tunnel being Built in Detroit to Form an Open-Cut Sewer: The Tunnel Floors of an Additional Section Are Ready to Have Moved onto Them the Collapsible Steel Forms from a Finished Section in Rear of the Section Seen, Where the Concrete Is Still in Process of Setting. Each of These Sections Is 20 Feet Long, and There Are Two of the Collapsible Steel Forms in Each Tunnel

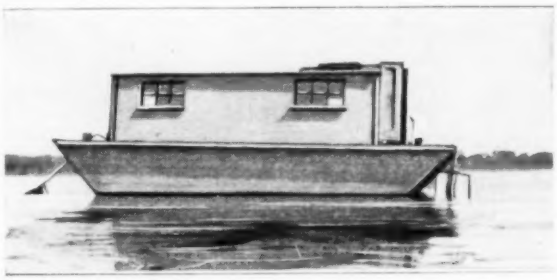
UNMANNED SHIPS CONTROLLED AND STEERED AUTOMATICALLY

Steering an unmanned ship by wireless has been considered one of the marvels of recent ingenuity. Now there is an invention that goes still farther, for it makes a ship absolutely self-steering without the intervention of any human agency whatever. A demonstration of the apparatus was made recently, at Great Bay, N. H., in a houseboat that was automatically steered over a predetermined course, having legs of different lengths and varying angles.



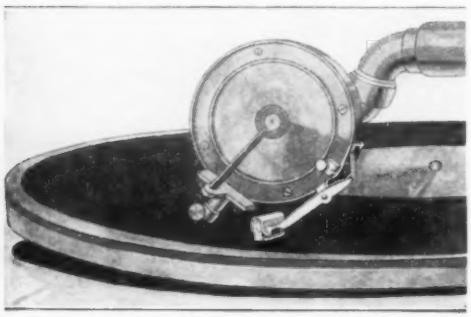
Group, Showing Mechanical Control and Steering Devices: The Compass Box "1" is Rotated and Timed by "2," So That, at the Proper Moment, It Causes "3" to Act upon the Steering Apparatus

The controlling feature of the apparatus is a box with three disks, by means of which the course of the boat is laid out. These have holes in them, in which pins are inserted to cause, by electrical means, a compass box to turn in the proper direction when the boat is to be brought upon a new leg. The turning of the compass box actuates the steering gear through a mechanism mounted in a third box. Only the first leg of the boat's course is regulated by setting the compass, which thereafter serves only to keep the boat from swerving from the course set for each leg. It is thought that the apparatus, in the same or some modified form, may be applied to the steering of airplanes, submarines, and perhaps even motor vehicles. It cannot be interfered with by outside influences as in wireless control.



Houseboat That was Steered by Means of an Automatic Apparatus over a Predetermined Course, Having Legs of Different Lengths and Varying Angles

AUTOMATIC CLEANING DEVICE SAVES PHONOGRAPH RECORDS



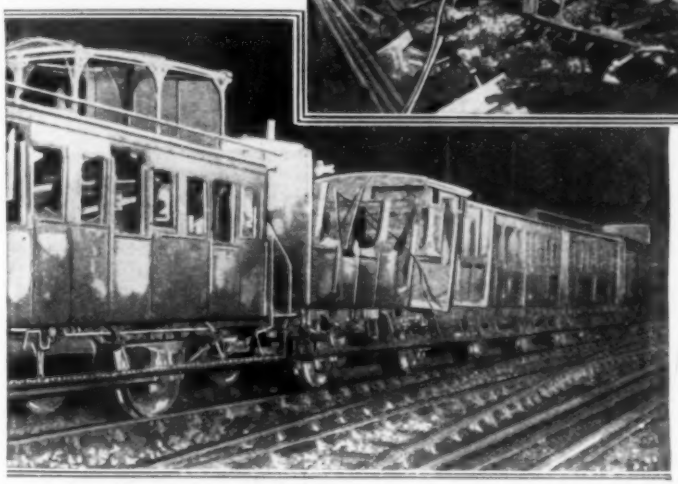
The Coil Spring Keeps the Little Piece of Felt Pressed Lightly against the Record, Cleaning It Before It is Touched by the Needle

Cleaning a phonograph record each time before it is played not only prolongs the life of the record, but also improves the music production. A simple little device does this automatically by keeping a small strip of felt pressed lightly against the record directly ahead of the needle. The felt strips are reversible and easily replaced. The device is quickly attached by a thumbscrew to the tonearm of any standard machine. It is made of brass, nickelplated, and should last a lifetime.

PARIS SUBWAY WRECK CAUSED BY SIGNAL FAILURE

During the evening rush hour, on October 5, a subway train crashed into the train ahead of it, in the unlighted Batignolles tunnel near the St. Lazare Station, Paris, France, owing to a failure of signals. When trains enter this tunnel a signal drops automatically, stopping other trains until the tunnel is signaled clear from the other end. Whether the signal failed to drop or was prematurely raised has not been determined. The first train was compelled to stop in the tunnel and the second train, four minutes behind, struck it. A gas reservoir exploded and fire spread to the wreck. It is reported that about 40 persons were killed and 100 injured. Demolition of this tunnel had been authorized, but was postponed because of the war. The work of demolition has been ordered carried out immediately.

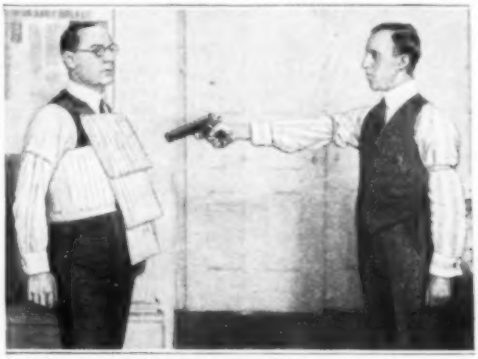
Some of the Burned Coaches of the Trains Wrecked in the Paris Subway Tunnel Where 40 Persons were Killed



Two Trains were Wrecked When One Crashed into the Rear of the Other Because of the Failure of Signals. An Exploding Gas Tank Set Fire to the Coaches and This Was Responsible for Many Deaths and Injuries

BULLET-PROOF JACKET PROVED EFFECTIVE BY POLICE TESTS

Armor, in the form of a bullet-proof jacket, has been adopted by the police department of New York City. This jacket, made of steel plate, silk, and canvas, and weighing only 6 lb., has deflected pistol bullets fired at close range in tests made in the shooting gallery at the department headquarters. A belt fits about the body from the armpits to the waist, and three plates extend from the throat to several inches below the belt in front, completely protecting all the vital parts of the body. It is supported by straps over the shoulders, which can be adjusted to fit the individual.



The Method of Wearing the Bullet-Proof Steel Jacket is Shown Here. It Protects the Vital Parts of the Body Perfectly, Even at Such Close Range as That Seen in This Case

FOOTBALL PLAYERS TRAINED WITH "BUCKING STRAP"

Something new in football-training apparatus has appeared on the practice field at Cincinnati University this season, in the form of a "bucking strap." Two long pieces of heavy leather are connected by two shorter straps, and the rectangular opening formed is thoroughly padded with heavy felt. The ends of the long straps are fastened to two wooden handles. By placing this harness over the shoulders of a candidate for the team, and assigning two of his teammates to hold back on the handles, he is given a thorough training in the tactics of smashing through the line and carrying the ball while dragging his opponents with him.

The Method of Using the New "Bucking Strap" is Well Illustrated Here. The Free Position and Sustained Effort of the Player Assist the Coach in Observing His Mistakes and Correcting Them

JAPAN TO HOLD LONG-DISTANCE OVERSEA AERIAL COMPETITION

The first Japanese long-distance oversea aerial competition is scheduled to be held between November 10 and 20 this year, under the auspices of the Imperial Aeronautical Association of Tokyo. The proposed course covers about 800 miles, with an all-night stop at Seoul, in Chosen, and the required flying time is estimated at about eight hours. Valuable cash prizes have been offered for first, second, and third places.

REMARKABLE RECORD MADE IN AIR-MAIL SERVICE

Little publicity has been given the remarkable record of Eddie Hubbard, of Seattle, Wash., who has been carrying mail under a special contract since October, 1920. He is required to make not more than 10 trips a month, and carry at least 600 lb., in all weather, between Seattle and Victoria, B. C. The letters are important correspondence for foreign ports. They are delivered to his hangar two hours before ships leave Victoria for Oriental ports. In this way important mail, which would otherwise miss the steamers, is saved eight or nine days' delay. On the return trip he brings similar mail, from the steamers, eight or nine hours ahead of the regular steamer mail. Hubbard has made a 100-percent record, making every trip in spite of weather conditions. It is estimated that he carries over 110,000 letters a month at a cost, to the government, that is more than met by the ordinary postage rate on the mail carried.

SHIPBUILDING FOR EMERGENCY FLEET CORPORATION ENDS

The last ship being built for the Emergency Fleet Corporation was launched, September 19, at Los Angeles. Thus ends the vast shipbuilding program of the corporation that was started under pressure of the war in August, 1917. Since then there have been launched on account of the corporation a total of 2,312 hulls of 13,636,711 tons. Of these, 1,309 were steel hulls of 8,927,695 tons; 384 were requisitioned steel hulls of 2,687,266 tons, under construction when the shipyards were taken over by the government; 18 composite hulls of 63,000 tons; 589 wood hulls of 1,885,250 tons, and 12 concrete hulls of 73,500 tons. In all cases the tonnage is deadweight. Of this grand total, all but 11, of 129,400 tons, have been actually delivered to the corporation, and it is expected that the last delivery will be made by the end of March, next year.

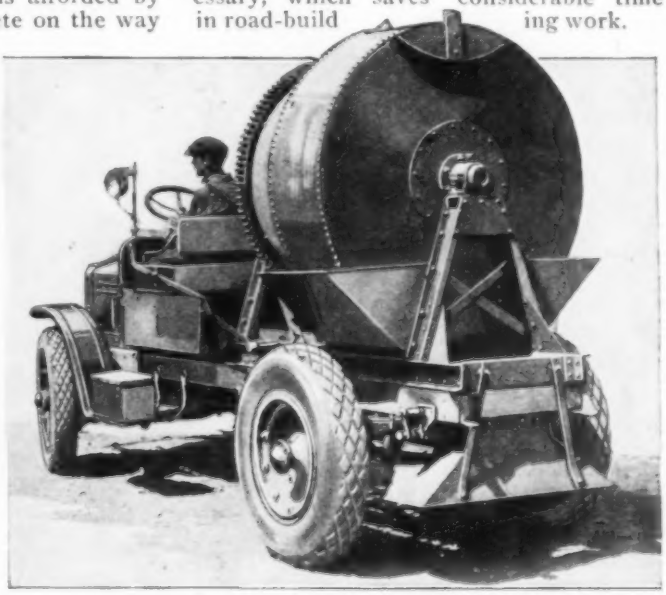
BY COURTESY OF THE STANDARD OIL BULLETIN

THRESHING WITH 10 INCHES OF SNOW ON THE GROUND

THRESHING is not ordinarily considered an occupation for winter nor associated with snow, but this case is one exception to the rule. The picture was taken on the Charles Abramson ranch near Lakeview, Ore. It is said that the work progressed without difficulty in spite of 10 in. of snow which covered the ground on the level, and there is not much ground in that country which is not level. The engine ran perfectly and the job was completed in a normal length of time.

TRUCK MIXES CONCRETE ON WAY TO WORK

Great economy of time is afforded by a truck which mixes concrete on the way to work. The ordinary truck body is replaced by a rotating concrete drum mounted on the chassis. Power to operate the drum is secured from the truck motor through a power take-off. The drum may be operated while the truck is moving at any speed, or when standing still. Stone, sand, and water are placed in the mixer before starting to work, and by the time the truck arrives at the job the concrete has been mixed ready for immediate use. It is discharged by gravity through a chute at the rear of the truck. As the truck moves forward the chute spreads the concrete so that only a small amount of hand spreading is necessary, which saves considerable time in road-building work.



This Concrete-Mixing Drum is Operated by the Motor of the Truck on Which It is Mounted. It can be Rotated While the Truck is Moving at Any Speed, or While It is Standing Still

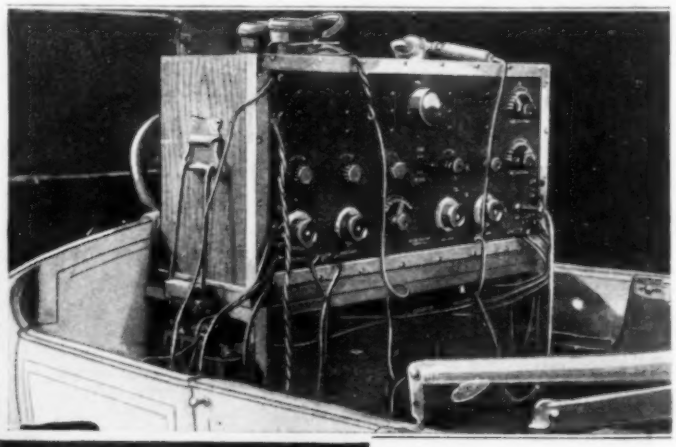
BICYCLE SIDECAR FOR BUNDLES IS SIMPLE AND INEXPENSIVE

A bicycle sidecar, for carrying bundles, is of simple and inexpensive construction. An L-shaped bar passes around one of the rear forks and is bolted to the seat-post bar. To this a second bar is attached by thumbscrews and extends to the side in a horizontal position. At the end a small rubber-tired wheel is mounted. A basket is attached to the horizontal bar. The spring-steel frame is sufficiently flexible to adjust itself to the swing of the bicycle and does not interfere with steering. When not in use, the horizontal bar may be detached and fastened in an upright position, out of the way.

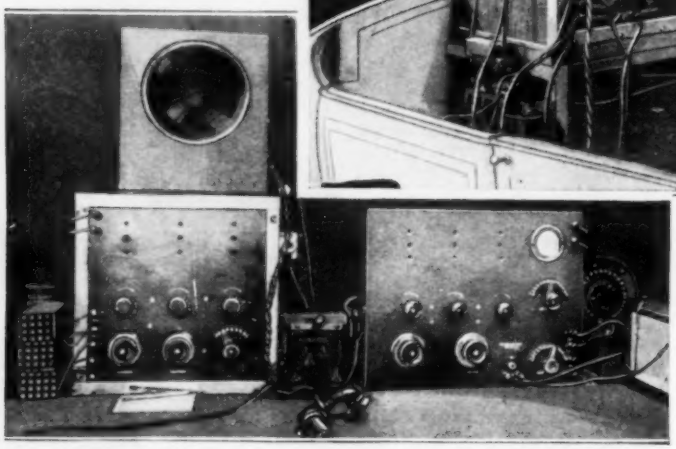
This Bicycle Sidecar Attachment, for Carrying Bundles, can be Folded Out of the Way, as Shown at the Right, When Not in Use

INSTALL WIRELESS TELEPHONE IN FIRE CHIEF'S CAR

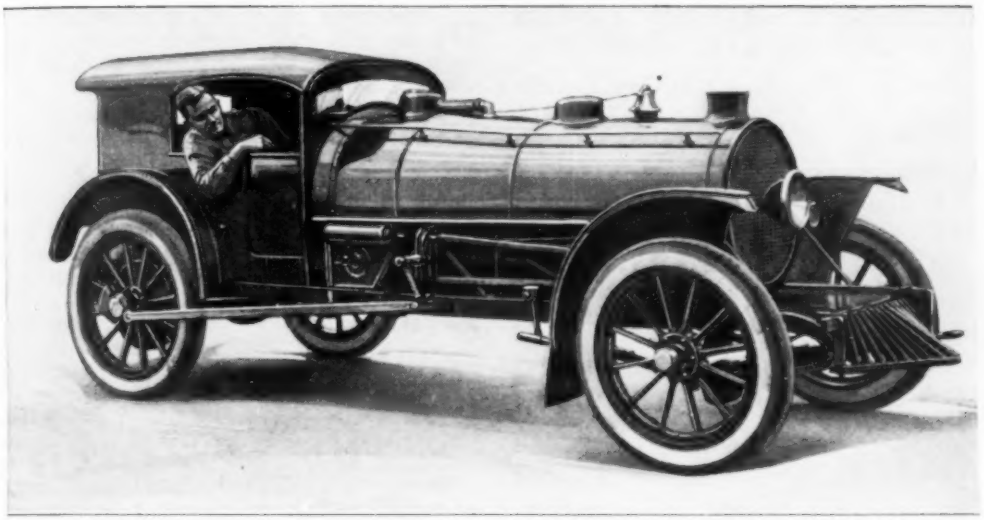
The Trenton, N. J., fire department has installed a wireless telephone in the department chief's car as well as at department headquarters so that the chief can keep in constant communication with it on the way to and during a fire. The aerial used in the automobile is carried in a sliding case and can be extended to 18 ft. The car itself serves as a ground. The transmitting and receiving set consists of a 500-volt generator connected with a 110-volt motor, three five-watt power tubes, two two-step amplifiers, three audion bulbs, batteries, switches, and transformers.



Wireless Set Installed in the Motor Car of the Chief of the Trenton, New Jersey, Fire Department



At Department Headquarters, This Radio Set is Used to Keep in Communication with the Chief, through the Set on His Machine, When He Is at a Fire



This "Cross-Country Locomotive" Develops a Speed of 60 Miles an Hour. Each Locomotive Feature has been Adapted to Some Actual Use in the Operation of the Machine, the Steam Dome, for Instance, in Front of the Cab Being the Opening to the Gasoline Tank

"CROSS-COUNTRY LOCOMOTIVE" IS INGENIOUSLY DESIGNED

For four years, F. A. Sternad, of Chicago, has devoted his spare time to designing and building a "cross-country locomotive," which is actually an automobile, and in which each apparent locomotive feature serves to camouflage some essential part of a motor car. The cylinder and driving rods are actually a pump that compresses air in a tank behind the cab. This air is used to inflate tires and blow the whistle. The steam dome, in front of the cab, is the opening of the gasoline tank, while the sand dome is an opening for ventilating the motor. Concealed in the smokestack is the radiator cap. Clean-out doors, in front of and below the cab, serve to ventilate it, and the air-brake cylinders above are an auxiliary air supply for the whistle.

ELECTRICAL MOVING ROAD PROPOSED IN JAPAN

A movable, electrically operated roadway has been suggested by a Japanese as a solution of the problem of getting traffic over steep hills. He has recently applied to the mayor of Yokohama for permission to carry out his idea on a hill between the shopping district of that city and the Bluffs, a foreign residential section. The promoter of the scheme is a native capitalist, and he claims that the idea and design of the moving road is his own invention.

HEATER FOR AIR AND WATER UNDER THE KITCHEN BOILER

A kitchen accessory that is an economizer of fuel is in the form of a combined air and water heater that heats the air, and thus keeps the room warm, at the same time that it heats the water in the boiler. Semicircular in shape, with an outside shell that is perforated for the emission of the heated air, it is placed beneath the boiler. Inside this shell is a second unperforated shell, and inside that is the gas burner, in connection with which are water tubes.

¶ Though lightning caused the fire, which destroyed three tanks containing $1,000,000 worth of gasoline at Beaumont, Tex., recently, it did not actually strike any of the tanks. According to the refinery experts, it was caused by the ignition of vapors rising from the tanks by lightning in the air.

WOODEN NEWS STAND REPLACED BY MODERN STEEL OUTFIT

The corner news stand has recently assumed the dignity which goes with modern steel "office equipment." A neatly

One of the New Steel News Stands in Use, Showing How the Top Opens to Form a Shelf: Below, the Stand is Closed and Locked for the Night

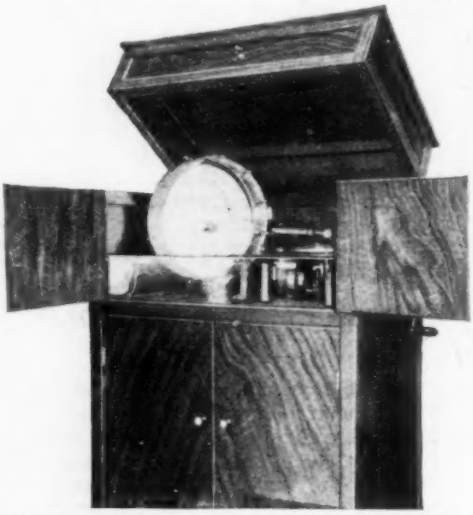
constructed stand of sheet steel, finished in olive green, has been adopted by some of the more progressive and prosperous Chicago newsboys. It is similar in construction to the ordinary news stand, but the lower part is made into a cabinet with doors which may be locked. The upper part folds down and is also locked outside of business hours. When open, it forms a shelf for papers and magazines. The appearance of this outfit is a great improvement over the cracked wooden stand which commonly occupies the city-street corner.

"FIRST" AND "SECOND-GROWTH" TIMBER INDEFINITE TERMS

Because the terms "first growth," or "virgin growth," and "second growth," have no fixed meaning, the United States Forest Service has recommended that the density of timber be used as a guide to quality. Though second growth usually means timber growing under conditions of lessened competition after part of the original stand has been removed, it is used also to mean timber, the growing conditions of which approximate those of a second-growth stand. First growth is generally taken to mean slow-growing timber, while second growth is relatively rapid. The more rapid growth results in wider annual rings, indicating stronger, tougher wood in hardwoods, and the opposite in pines and firs. Besides the indefiniteness of the terms, there are variations in growth which make the width of annual rings an unsatisfactory guide to quality.

TAMBOURINE REPLACES HORN ON "DARKY'S" PHONOGRAPH

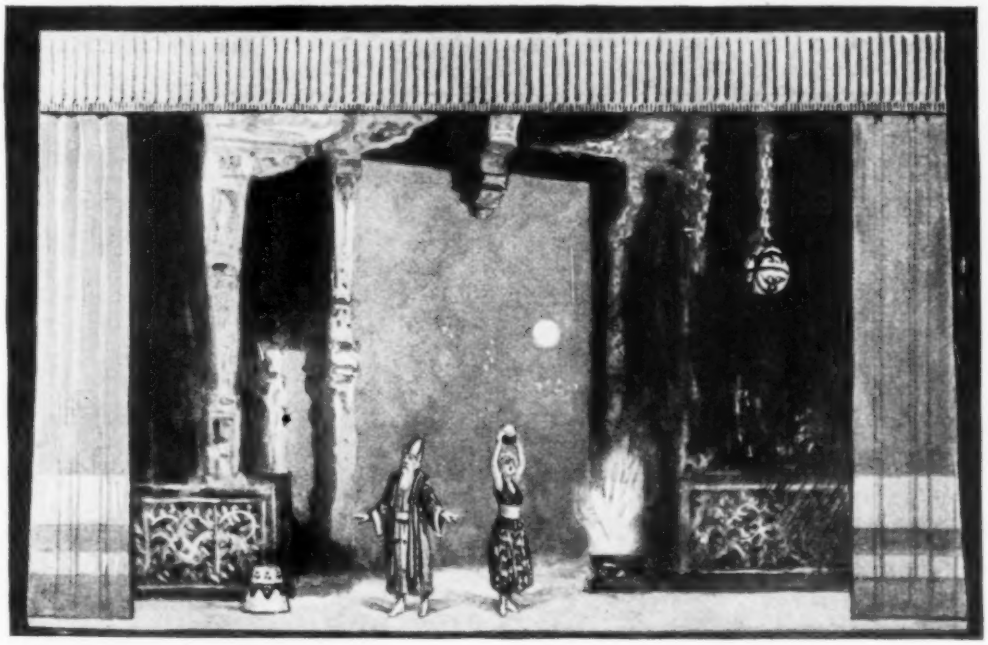
Before the days of the Salvation Army, of "ragtime," or of "jazz," the colored minstrel gave vent to his inborn love of lively music by the profuse use of the tinkling tambourine. It is to the colored-minstrel orchestra what the bagpipe is to the Highland regiment. Therefore it is not surprising that a southern "darky" has installed a tambourine in his phonograph. He took the horn off and changed the reproducing mechanism in such a manner as to operate on a tambourine that he connected to it in place of the horn, and to yield a novel accompaniment to the music from the record. This



The Horn of a Phonograph Replaced by a Tambourine, or the Drum Part of a Banjo, by a Southern Colored Minstrel: It Emphasizes "Jazz"

was particularly suitable to ragtime or jazz. A similar result can be obtained with the drum of a banjo.

STAGE SCENES CHANGED BY COLORED LIGHTS



ANOTHER marvel in stage effects has been accomplished with the aid of science. Above is shown a daylight mountain scene with a dark-bearded magician, in dark clothing, and a dark-haired girl in modern clothing, on the stage. This scene is changed instantly, by a change of lighting, to the Indian temple, at night, seen below. The magician becomes a white-bearded priest in a striped gown. The girl now has fair hair and wears an oriental costume. The illusions, the work of a young Russian, are produced by the use of light rays, of many shades, coming from all parts of the stage, and controlled and blended by an instrument of his own invention.

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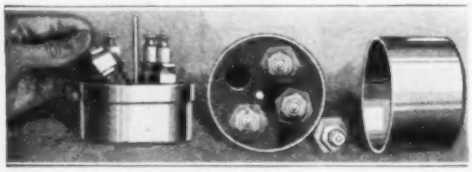
METAL CONTAINER PROTECTS AND CLEANS SPARK PLUGS

A novelty of interest to every auto and other motor-vehicle owner is a small container by means of which extra spark plugs can be kept clean at



The Spark-Plug Container and Top: In the Center the Container Has One Plug Removed to Show How the Plugs are Screwed into the False Bottom

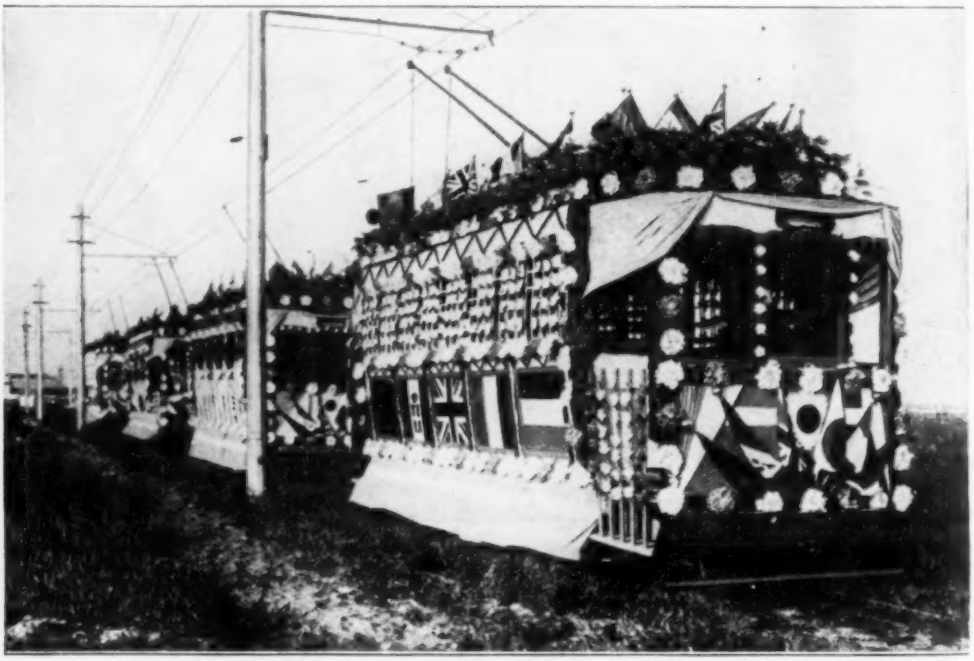
all times and protected from breakage. This container is a cylindrical cup with a false bottom above the regular bottom. Four holes in the former are provided with threads. The spark plugs are screwed into these holes, the platinum points being immersed in gasoline, in the bottom cavity. A cuplike top is put on the container, which then can be safely carried in the tool box. The motion of the machine shakes the gasoline about and cleans the plugs, so that they are always ready for replacing others which become dirty or defective.

PROPOSED HYDROELECTRIC PLANT IN SOUTH CAROLINA

To obtain 4,000 hp. of continuous power, and possibly three times that much secondary power, a southern railroad and navigation company proposes building a 24-mile navigable canal from the Santee River to the headwaters of the Cooper River in South Carolina. The plan includes a power house at the southern terminal of the canal. A permit for surveys to ascertain the effect of the diversion on the navigability of the Santee River, has been granted.

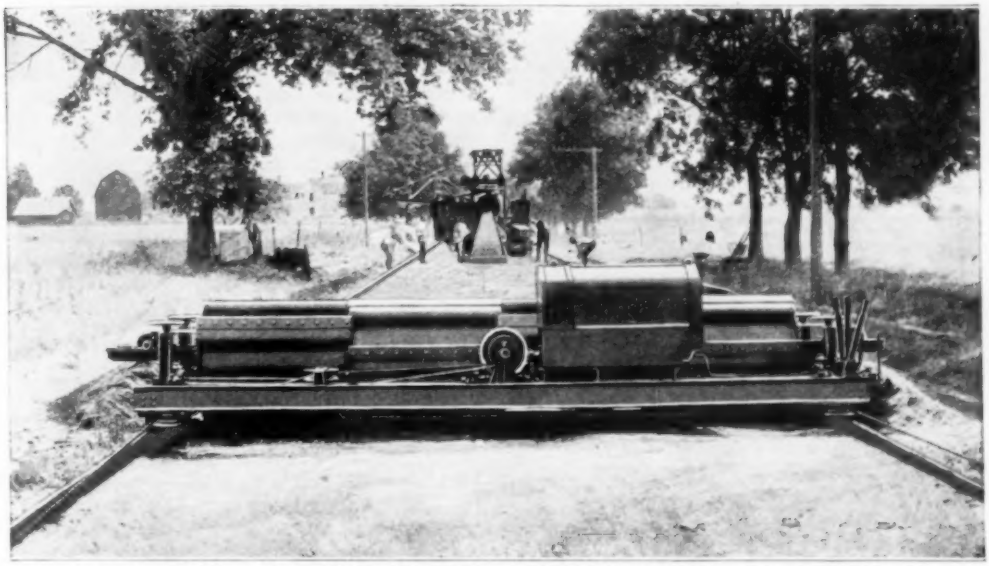
JAPANESE PRINCE WELCOMED BY DECORATED STREET CARS

Crown Prince Hirohito, of Japan, recently paid a formal visit to the rulers of various European countries. Upon his return to Tokyo he was given an elaborate welcome. Even the street cars in actual service at the time were decorated. The flags of the countries visited by the prince were put along the sides and front ends of the cars, while the headlight was made to look like the "rising sun" of the Japanese flag. Quantities of chrysanthemums were also used all over the cars.



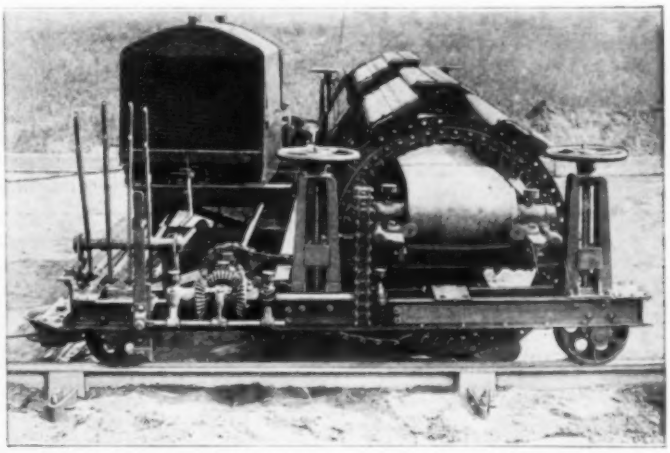
Street Cars Decorated in Honor of the Return of Crown Prince Hirohito of Japan: The Flags on the Sides of the Cars Are Those of the Countries Visited by the Prince. The Headlight of the Car is Made to Look like the Japanese Flag

MACHINE CUTS MECHANICALLY TRUE ROAD SUBGRADE



The Road Forms Serve as a Track along Which the Subgrader is Drawn by the Cables, Which can be Seen Running over Pulleys, at Each Side of the Machine. The Dirt Cut from the Surface of the Roadway is Seen Piled Just outside the Forms Where It was Deposited by the Conveyor Belt

A road-building machine, which is attracting attention among road engineers and contractors, is a new one-man gasoline-operated subgrader. It is designed to save labor in finishing the road after it is rolled and before the concrete is laid. It cuts a mechanically true grade, which means a substantial saving of concrete. Cables are used to pull the machine along the road forms. The 4-ft. digging buckets, equipped with removable steel plow lips, can be set to cut to depths of from 2 to 4 in. The entire cut is 20 ft. wide. In trimming the road, two plows shave off the sides between the forms and the buckets, then trim the surface, depositing the dirt on a 15-in. conveyor belt which discharges it outside the forms. One passage of this machine over the surface of the roadway leaves the grade perfectly prepared for the laying of the concrete.



The Wheels on Which the Machine Runs, as Well as the Arrangement of the Digging Buckets and Conveyor, are Clearly Shown Here. As the Buckets Pass over the Belt, the Dirt Falls upon It and is Carried to the Roadside

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¶The greatest single, unbroken telegraph circuit ever operated was used to report the eight games of the world's championship baseball series at New York City. The news was dictated by a reporter to a single operator who transmitted it over 45,000 miles of telegraph wire. It was received throughout the country by newspapers and bulletin boards practically simultaneously with the actual play.

TWIN-DIAL INCLINOMETER OF GREAT PRECISION

Angle-measuring instruments, known as inclinometers, have been in use for some time in connection with the airplane, the

Angle Indicator Which Gives Accurate Readings for Precision Work in Machine Shops, Shown in Setting Up Lathe, and Above, Setting a Machinist's Protractor

automobile, and surveying, and now there is an instrument of this kind that is capable of exceptionally precise accuracy, for use in mechanical laboratories, and wherever such fine measurements are needed. This extreme accuracy is obtained by the use of two dials, one for degrees and the other for minutes, which are side by side on the face of a carefully machined metal case that contains an accurately adjusted gear train. The gear, in connection with the hand on the degree dial, operates by gravity, this hand remaining always vertical, no matter at what angle the instrument is held. This dial is graduated for 180°, in 10° spaces, and gearing rotates the hand on the minute dial in such a manner that by means of its graduations the fractional degree of the ten on the degree dial, as well as the fractional minute, can be read. The minute graduations are large enough to be able to judge as close as half or quarter minutes. In connection with the instrument are levers by means of which the operator can eliminate all retarding effect due to bearing friction, and cause the hands to give an absolutely true reading.

MONO-SEAPLANE MAKES FAST TRIP WITH PASSENGERS

Carrying three passengers besides the pilot, a Loening monoplane flying boat recently made one of the fastest flights known for seaplanes, though no record was established. The plane left Aberdeen, Md., and landed at Philadelphia, Pa., where one passenger was "dropped," in 30 minutes. It hopped off 10 minutes later and reached Port Washington, L. I., in 40 minutes. The 188 miles were covered in 70 minutes or at a speed of 161 miles an hour. A 400-hp. Liberty motor furnished the power.

HUGE ROLLER BEARINGS CARRY DOORS OF IMMENSE HANGAR

The sliding doors of the great dirigible hangar at Lakehurst, N. J., are said to be the largest unit load ever carried on anti-friction bearings. There are two doors at each end of the building and each of them is 135 ft. high, 165 ft. wide, and weighs 3,500 tons. They are not of the usual suspended type, but are entirely free from the hangar building and run on standard-gauge railroad tracks, each on four eight-wheeled trucks. Each is operated by an electric motor, or by a hand windlass in case of emergency. The 32 journal boxes, with their cast-steel roller-bearing housings, weigh 392 lb. each, and the load capacity of each bearing is about 150 tons. Without the housing, the bore of the bearing is 7 in., its outside diameter is 13½ in., and its width

The Roller-Bearing Equipment of a Single Door of the Great Lakehurst, New Jersey, Dirigible Hangar is Shown Here

6½ in. In order to resist wind pressure, the doors are heavily weighted with concrete and steel at the base and are 15 ft. thick at this point.

TOYS "MADE IN AMERICA" TEACH AND TRAIN

By Harry A. Mount

IT is obviously impossible to describe in a single article the hundreds of new toys which are being brought out at this time. In selecting the toys described herein, preference has been given those which incorporate some new idea, or, in instances where there are several toys of equal merit, the one most representative of the group is described.—Editor.

A MANUFACTURER of machine-shop lathes recently placed on display in his salesroom an exact miniature replica of one of his big lathes, and over it a card which bore this legend:

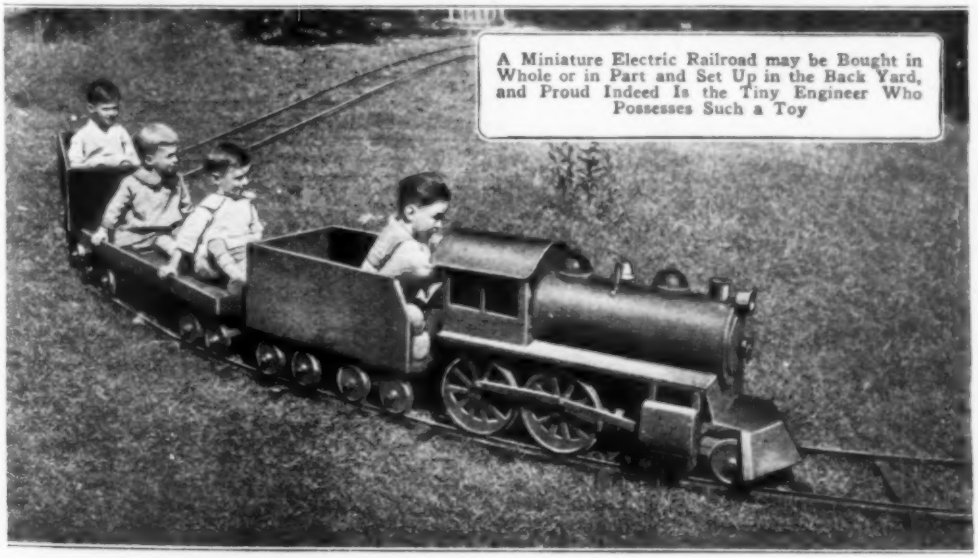
"Buy one of these for your boy and the poor lad will never get near it!"

The fathers of some millions of sons in this country are going to have a lot of fun with the toys they will open on next Christmas Eve—such toys as never before have been seen in this or any other country. One suspects, after seeing them, that in many instances these new toys have been made to please the elders rather than the children. Many of them hardly fall within the classification of toys, so complete in detail and so sturdily made are they.

These new toys are American-made and behind nearly every one of them is the fundamental thought that a child learns something from every toy—even though the lesson may be one in destructiveness. Into the toys which are soon to appear on the market have gone all the ingenuity and skill which American makers could put into them, because this is a crucial year. Upon the results of this year depend largely the future of this new American giant—the toy industry.

A Pocket in Each Page of This Modern "Mother Goose" Book Holds a Wooden Cut-Out Doll Which Stands Alone and Has Fascinating Movable Parts

Before the World War the United States imported more than half of its toys. Especially mechanical toys and



A Miniature Electric Railroad may be Bought in Whole or in Part and Set Up in the Back Yard, and Proud Indeed Is the Tiny Engineer Who Possesses Such a Toy

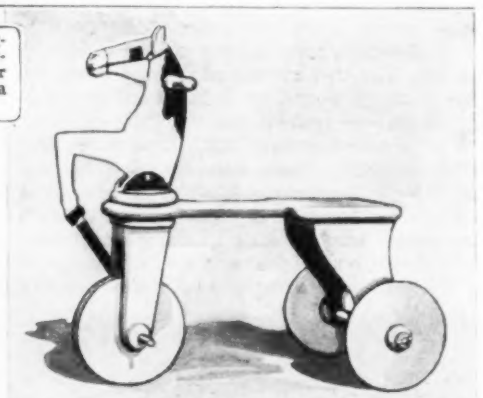
dolls were imported almost to the exclusion of domestic toys. Those manufacturers who tried to make and market these toys here found they could not compete with foreign prices and that toy buyers were not even willing to give them a hearing. Then came the war and the importation of toys stopped almost overnight. In fact, millions of dollars' worth, ready for shipment, were held in warehouses abroad for several years and were "dumped" on the market here just before last Christmas.

With foreign toys off the market those toy makers already in the business here could not meet the demand and new concerns sprang up. The development of the infant industry has been phenomenal and last year the product was worth more than $80,000,000. But so far the manufacturers had had little or no competition from abroad and the shortage of toys made it possible to market almost anything they could make. During the coming year, toy manufacturers in this country will have to meet a strenuous attempt on the part of foreign makers to regain lost business here, and to compete with additional large imports of cheap toys from Japan, but there will be the keenest rivalry among American makers.

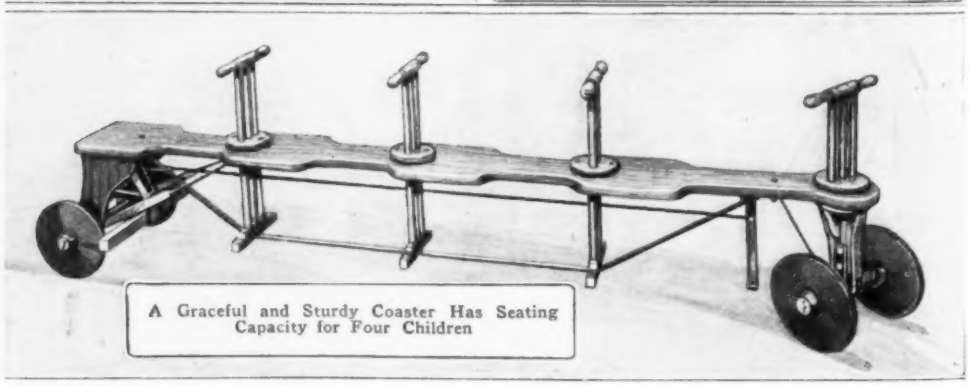
Toys naturally fall into several groups, the largest of which is the dolls. Doll making is something of an art, and it has been hardest of all to adapt to American manufacturing methods. But suffice to say it has been successfully done, and there are appearing this year a number of walking, talking, and sleeping dolls.

Next in point of production come the games and books. This branch of the toy industry has always been firmly established in the United States, and so there is only a "normal" output of new things. There are a number of new games in which skill is an element. One of these makes use of a mechanical football player. A small celluloid ball is dropped between the outstretched tin hands of the figure, and in falling it strikes a trigger which releases the foot. The ball is kicked a distance of several feet, and it can be

In a Combination Rocking-Horse-Kiddie Car the Forward Motion of the Rocker Sends the Vehicle Ahead a Foot or More



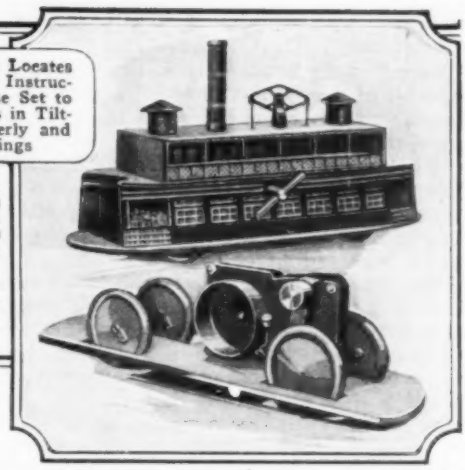
A Worthy Steed for the Smallest Boy Depends upon the Motion of the Horse's Head for Propulsion

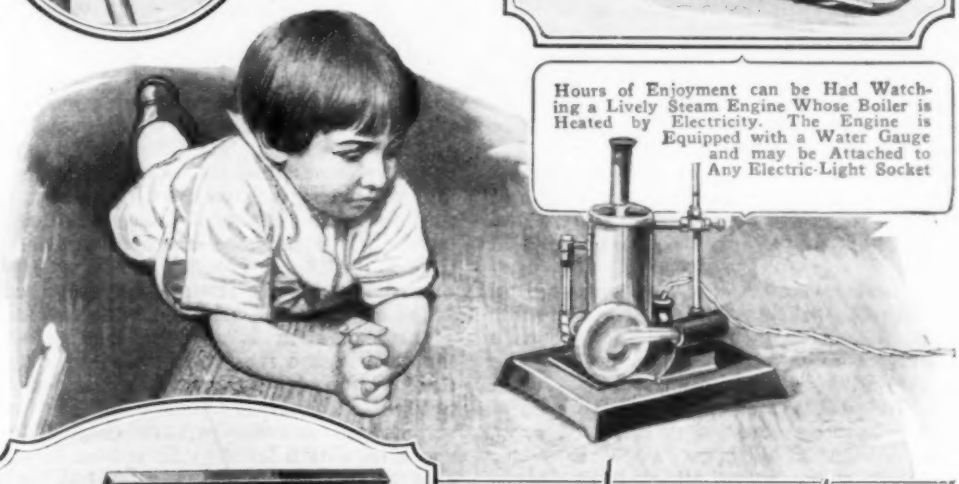


A Graceful and Sturdy Coaster Has Seating Capacity for Four Children

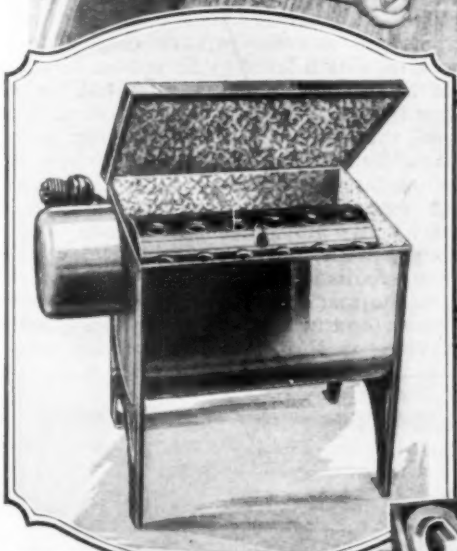
The Telescope on the Left Locates Real Stars. A Book of Instructions is Furnished with the Set to Aid Amateur Astronomers in Tilting the Instrument Properly and Verifying Their Findings

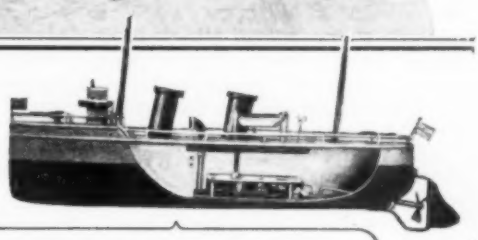
Right: A Ferryboat, Which Runs on the Floor, Stops, Rings a Bell, and Reverses When It Hits an Obstruction. Below: The Weights Which Control the Reversing Mechanism





Hours of Enjoyment can be Had Watching a Lively Steam Engine Whose Boiler is Heated by Electricity. The Engine is Equipped with a Water Gauge and may be Attached to Any Electric-Light Socket





Any Youthful Mechanic would be Delighted with the Steel Boat Shown Above Because the Mechanism Is Removable. These Ships may be Had in Various Types of War and Merchant Vessels. Below is Shown a Molding Set and Some of Its Possibilities

A Tiny Washing Machine "Just Like Mother's," Which Is Rustproof and cannot Harm Dolly's Nicest Finery, will Appeal to Any Industrious Little Girl. They Come for Either Hand Power or Electricity

"placed" very accurately if the player be skillful in dropping the ball. A game following in general the lines of the game of football is played with it.

The newest idea in books for children is a "Mother Goose" in which the characters are made of wood and fit in pockets in the pages. Each character has one or more movable parts to add interest, and there are provided metal stands so that the child can take them out of their places and play with them. The manufacturer of these books has devised a new method of printing the characters directly on wood with oil paint so that they can be washed occasionally or even chewed by the baby without serious injury to baby or toy.

Outdoor toys deserve a separate classification, for they are almost exclusively an American creation. These include wheel toys of the kiddie-car type, of which there is almost an endless variety. Some of the new models are made of steel. Others are propelled by pedals, and one, which has a horse head mounted in front, is operated by rocking the head back and forth. A steel connecting rod communicates this motion to a double front wheel. Another has a trailer with a boxlike body, and by interchanging the body and seat and other parts, several kinds of pull toys can be made from it.

Another toy consists of a kit of parts from which 20 different wheel toys can be made, every one of which is an exceptionally well designed and sturdy toy.

Another of the three-wheeled toys is large enough to hold seven or eight children and has an especially strong "patrol-wagon" body. An extra board carried underneath serves as an endgate or an extra seat, as the vehicle is a dump cart or a jitney bus. Another firm is making a tandem type of car in sizes to hold two, three, four, and five children.

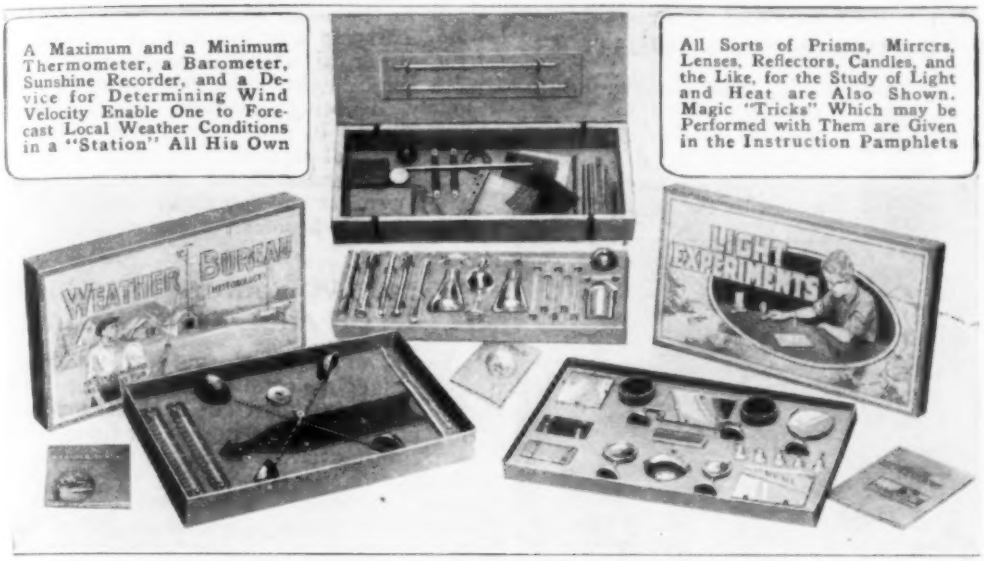
The newest thing in railroad equipment is not meant for use on the nursery floor, but for actual transportation out-of-doors, over a track having curves, and laid with ties, bolts, and fishplates. The locomotive is run by a battery, and the equipment includes a charger. This, of course, falls in the expensive class, but one can buy the flat car or the box car another Christmas.

The field in which there is keenest competition, both from abroad and among domestic manufacturers, is mechanical toys, and here American toy makers have made a supreme effort. Again a wide departure from precedent has been made, and the term "mechanical" can barely be stretched to cover the wide variety of toys usually classed under it.

There are only a few new ideas in the toys which once were predominant in this field—that is, toys which wind up and go through some ingenious but meaningless evolutions. But some meaning has been given to even these toys by the newest creations. There is, for instance, a ferryboat which, when wound up, runs along the floor until it strikes some obstruction. Then it stops for a moment, a bell rings twice, and the boat reverses. The mechanism is as ingenious as any that ever came from abroad. The direction of the driving gear is changed by two poised weights, which when the boat strikes an obstruction, are carried forward, moving a lever by their own inertia. The final drive gear is mounted on a screw thread and when reversed, it travels across the shaft without moving the boat, meanwhile ringing the bell. When it reaches the opposite end of the shaft, the boat moves in the opposite direction. Both boat and mechanism are very strongly built and the mechanical effect is most realistic.

But the marked tendency to make even this sort of toy instructive as well as entertaining is shown in the creation of a

These Boxes Hold Equipment for Tin-Can Toy Making (left) and Glass Blowing (right)



A Maximum and a Minimum Thermometer, a Barometer, Sunshine Recorder, and a Device for Determining Wind Velocity Enable One to Forecast Local Weather Conditions in a "Station" All His Own

All Sorts of Prisms, Mirrors, Lenses, Reflectors, Candles, and the Like, for the Study of Light and Heat are Also Shown. Magic "Tricks" Which may be Performed with Them are Given in the Instruction Pamphlets

complete line of toy tractors, automobiles, and trucks of knockdown construction, which are assembled by the purchaser. A powerful spring motor has been developed. A similar toy tractor, already assembled, will pull a weight of more than 50 lb. on a level floor, even though its own weight is only about two pounds.

A famous maker of toy trains is introducing a line of toy steel boats, driven by spring motors. Included are every type of battleship, passenger steamer, and merchant ship. The maker has conceived and executed the idea of making the spring motors detachable so that by the removal of a thumbscrew they may be taken out for cleaning and oiling. In order to keep the center of gravity of the boats as low as possible, the motors are made to lie flat on the bottom, and without the removable feature, it would be very difficult to keep the motor from quickly rusting out.

Not all the mechanical toys are for the boys, however; an electric washing machine which can be connected to any lamp socket, and which works up the foamiest suds imaginable, is designed to delight any little girl. However, the slightest touch on the washing cylinder stops it, so that small hands are not endangered. The machine also comes without the motor, and equipped with a crank.

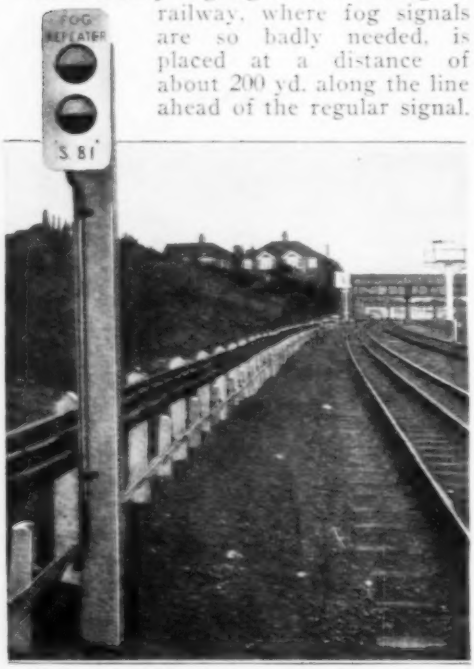
Probably the most fascinating of all the toys, however, are the "scientific" and "structural" toys which have been a purely American development. Not only do these toys provide absorbing amusement for the average boy (and his father), but they satisfy a natural curiosity. A boy's play hours mean most in his mental development when he has reached that age where he is likely to dissect the family alarm clock to see what it is made of, and when his inquiries into the natural phenomena about him begin to "stump" his elders. Herein, no doubt, lies the explanation of the tremendous popularity of the toy which can "do things."

A manufacturer of scientific toys produces play sets which will cover in an elemental way most of the branches of science and the better-known fields of engineering. In addition to a variety of sets on electricity and chemistry, which have been on the market for several years, the new toys will initiate the boy into the mysteries of light, sound, heat, civil engineering, pneumatic and hydraulic engineering, signal engineering, glass blowing, weather forecasting, mineralogy, and microscopy.

The telescope furnished with one of these sets was designed by a professor of astronomy of a large university. It has mounted parallel with the instrument a "star finder"—a tube with small holes at each end through which one sights at the North Star. Once this star is located the telescope may be pointed at any other star simply by setting pointers on two calibrated disks on the telescope mounting, according to directions. The star then is examined through the telescope. A booklet which accompanies the instrument, written by the designer, is an elementary course in astronomy.

RAILWAY SIGNAL DUPLICATED FOR USE IN FOGGY WEATHER

An auxiliary fog signal on an English railway, where fog signals are so badly needed, is placed at a distance of about 200 yd. along the line ahead of the regular signal. It is in the form of a post, about 10 ft. high, carrying a yellow lens and a green one, either of which is moved in front of a bright light when the signal is set, yellow denoting "danger," and green, "line clear," in the same manner as the regular signal beyond it. In clear weather only the regular signal is used, but in foggy weather the signalman switches on the auxiliary besides.

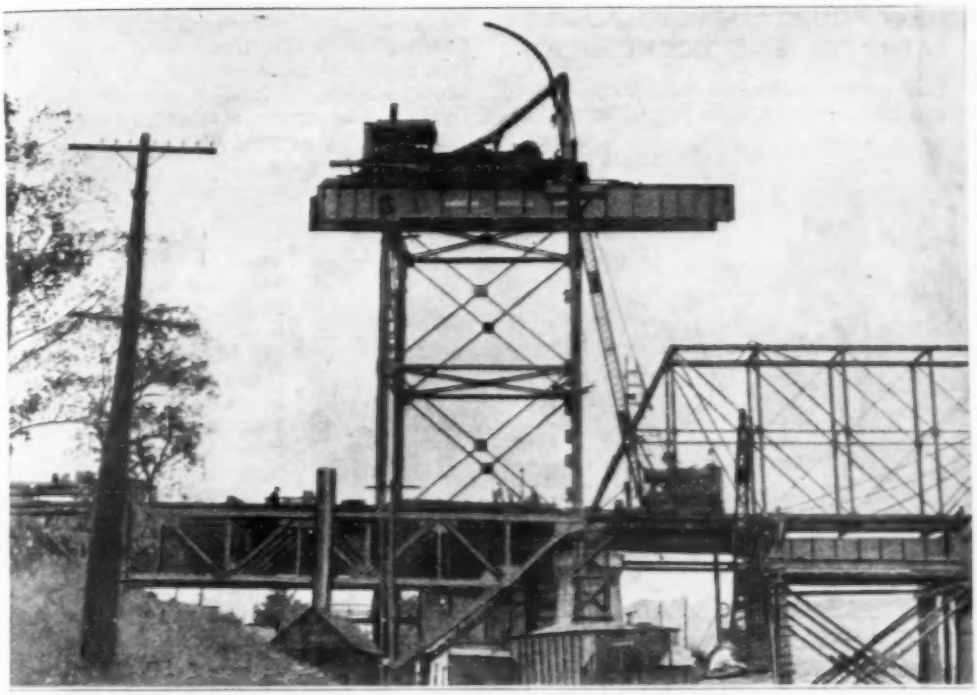


Duplicate Railway Signal Used in England as an Auxiliary to the Regular Signal in Foggy Weather, Giving a Double Chance of Reading the Message

EXTINCT VOLCANO WAS BURIAL PLACE OF ANCIENT HAWAIIANS

Hawaiian tradition, that the crater of the extinct volcano Haleakala, on the island of Maui, served as a burial ground for Hawaiian chiefs, in ancient times, has been substantiated by recent discoveries of an eminent ethnologist. Three terraced platforms, surrounded by stone walls, were found in a cone in the center of the crater. In a near-by cone was a stone cairn in which was the skeleton of a woman, placed face down with the knees flexed. Two poles of mamane wood above and at either side suggested a sort of litter for carrying bodies. Pieces of calabash were also found, as well as a dog's tooth, white bird feathers, and smooth water-worn pebbles. Haleakala is 10,032 ft. high, and its crater, which is 2,000 ft. deep and 20 miles in circumference, contains many of these cones.

The Crater of Haleakala, the Great Extinct Hawaiian Volcano: The Two Cones Seen in the Picture Are Two of Those Which have been Excavated and Found to Be Ancient Burial Places. These Cones Are 500 Feet and 750 Feet High, Respectively, Which Gives One an Idea of the Great Size of the Whole Crater



This Piledriver, Mounted on a Flat Car, and Resting on a Platform at the Top of a 100-Foot Frame, Presents a Most Unusual Appearance. It is Used in the Construction of a Railroad Bridge over the Ohio River at Cincinnati

DERRICK RAISES PILEDRIVER AND FLAT CAR 100 FEET

One of the highest derricks in the world was used to raise a piledriver, mounted on a flat car, to the top of a 100-ft. platform. In constructing a railroad bridge over the Ohio River at Cincinnati, it was necessary to use a piledriver at a great height. A frame and platform, of structural steel, were built, extending 100 ft. above the bridge level. The piledriver and flat car were lifted onto the platform, by the giant derrick, where they will remain until the bridge is completed. In this position they present a most unusual appearance.

SCORE-CARD HOLDER CLIPPED ONTO THE TABLE EDGE

Score sheets for card games are most conveniently provided by a simple holder of sheet metal and wire. A metal plate is bent to form a cylinder at one end, which comes below the upper surface of the plate. Each end of the cylinder is provided with an inside projection to hold a roll of paper. The end of the paper passes through a slot in the cylinder and is held in place on the plate by a rectangular wire frame, fastened to the plate. On the underside are two spring clips, by which the holder is fastened to the table edge.

Above: The Score-Card Holder Attached to the Playing-Table Edge. In the Insert Are Two Views of the Holder, Showing the Spring Clips by Which It is Attached to the Table and the Paper Roll

¶ A new 140,000-hp. hydroelectric project is planned in Formosa, by the Japanese government, which will cost $24,000,000 and require six years for completion.

NEW FOUNTAIN WASHBOWLS SANITARY AND ECONOMICAL

Sanitation finally has been extended to the common washbowls in public and industrial lavatories by an adaptation of the fountain idea. A round bowl is made in two sizes, 54 in. and 32-in. diameter, to accommodate 12 and 6 persons, respectively. The flow of water is converted into fine streams at the center of the bowl, and no more water is consumed by the larger unit than by a single washbowl. Either a hand valve or a foot lever is supplied to control the flow. Besides the economy of water these fountains afford an economy in installation and upkeep cost, and in floor space. Equipment for 24 persons requires only 64 sq. ft., while 24 ordinary washbowls require 91 sq. ft. The bowl is made of a composition of marble chips and concrete, finely ground and polished, and is easily kept in a clean and sanitary condition at all times.

The Fountain Washbowl in Use: The Fine Streams of Water, Controlled by the Hand Valve on Top, Are Very Effective. The Fountain is Equipped with Sanitary Liquid-Soap Containers, or Receivers for Cake Soap, as Desired

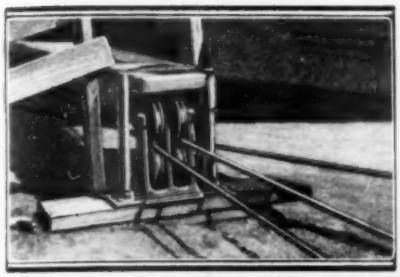
LONDONER TRAVELS STREETS ON MOTORCYCLE RUNABOUT

A London resident solves the parking and garage problem with a curious little runabout. For getting in and out on crowded thoroughfares, for ease in repairing and cleaning, and for speed, he has all of the advantages of a motorcycle. The motive power is derived from a 2½-hp. engine. There is some room for packages under the seat.

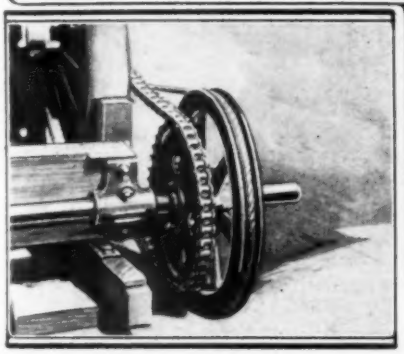
This Low, Speedy Runabout Gives Its London Owner the Combined Advantages of the Motorcycle and the Runabout

IMPORTANT SERVICE RENDERED BY COMMERCE BUREAU

The records of the Bureau of Foreign and Domestic Commerce show that, during the year ended June 30, 1921, it has been particularly serviceable in assisting American business in securing contracts for public works throughout the world, including enterprises in Australia, Serbia, Costa Rica, New Zealand, Ecuador, and Turkey. More than half a million "trade lists" were sent out in response to requests for names of foreign buyers. About 40,000 persons calling at district offices, and several thousand at the central office in Washington, were given trade assistance, while district offices made 2,797 calls on business firms. Trade disputes, numbering 600, were handled by the bureau as a voluntary intermediary, with the result that disputes involving hundreds of thousands of dollars were settled in a way to lessen repetition and create good feeling toward American goods. Trade-promotion efforts, by the bureau's Berlin office alone, netted about $2,000,000 business for American firms.



At the Right: The Automobile-Operated Merry-Go-Round is Shown Set Up at a City Fair. Above: Eight-Inch Pulleys are Placed between the Auto and the Merry-Go-Round to Keep the Power Cable in Place. Below: Two Large Sprockets, Connected with Smaller Sprockets on the Rear-Wheel Hubs, Drive the Cable over a Grooved Pulley

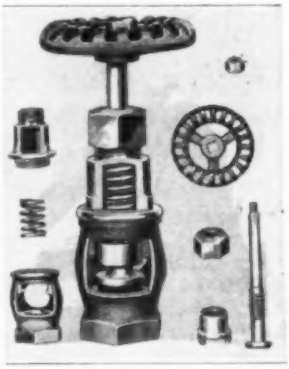


AUTOMOBILE OPERATES MERRY-GO-ROUND

A gasoline roadster is primarily a pleasure conveyance. It is, however, occasionally called upon to perform some profit-producing service, and this is the case of a machine used to drive a merry-go-round on the Pacific coast. Its owners, both machinists, fitted a small sprocket to each rear hub. They next built a jack which raised the rear end of the car clear of the ground. Directly back of the car wheels, and rigidly held away from them, a countershaft was mounted, and provided with larger sprockets driven by chains from the car-wheel sprockets. A large grooved pulley was fitted at one end of the shaft. From this pulley, power to revolve the merry-go-round is transmitted by cable. In operating the combination, the driver manipulates the roadster as usual in road driving. The auto is a cheap means of propulsion compared with costly and inconvenient electric motors, but the great advantage consists in its ready portability, when the merry-go-round proprietors are ready to move on to a new stand.

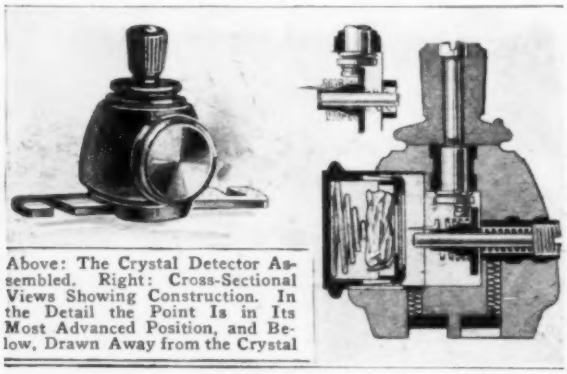
NEW VALVE GRINDS ITSELF WHEN OPENED OR CLOSED

A valve, with a metal-to-metal seat, that should never have to be taken apart for regrinding, because it grinds itself each time it is opened or closed, is now on the market. This self-grinding is made possible by a construction that allows the valve to be given one turn after it is seated, without causing it to move any closer to its seat, upon which it is held firmly by a spring. In opening it, the valve makes this same turn backward before it begins to leave its seat. Any contraction of the valve stem is automatically taken up by the action of the spring.



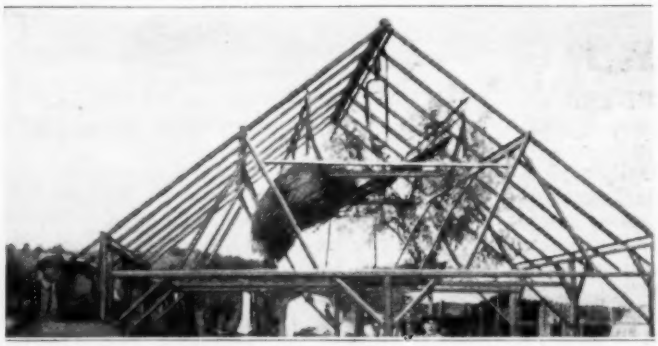
FRENCH RADIO AMATEURS USE NOVEL CRYSTAL DETECTOR

A crystal detector which has become very popular among radio amateurs in Europe, and especially in France, is entirely novel in operation as well as appearance. At the top is a handle, terminating on the inside in a disk upon which is eccentrically mounted a milled stud. This bears against the flange of a sleeve that carries the contact point on its tapered front part, and is pressed forward by a spring. By turning the handle, two motions are imparted to the sleeve, one back and forth, by which the pressure of the contact point against the crystal may be adjusted with great nicety, and one rotary that changes the point of contact with the crystal. The latter purpose may also be accomplished, when the contact point is out of central alinement with the crystal, by turning the cell in which the latter is inclosed. Between the contact point and the crystal, a screen of nonconducting material is mounted, by means of which vibration of the contact point is prevented. The whole instrument is only about 2 in. high, and is conveniently mounted on a connector, for easy insertion under the nuts of the binding posts.



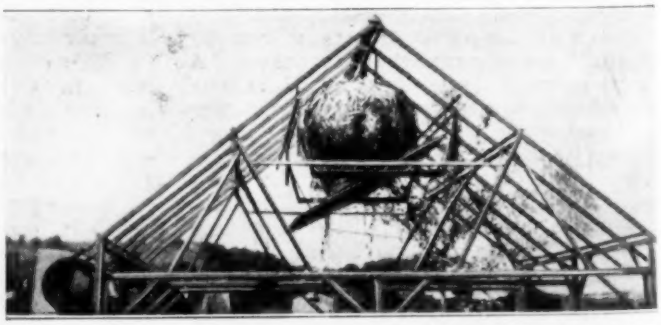
Above: The Crystal Detector Assembled. Right: Cross-Sectional Views Showing Construction. In the Detail the Point Is in Its Most Advanced Position, and Below, Drawn Away from the Crystal

MACHINE DISTRIBUTES HAY IN THE LOFT OF BARN

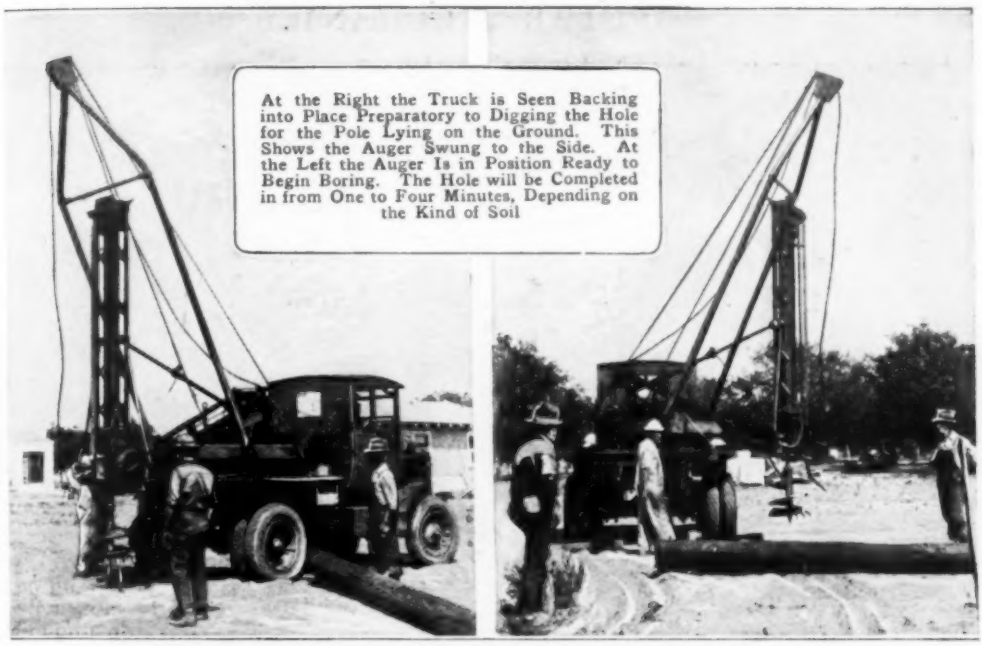


When the Rope is Pulled, the Platform of the "Mower" Tips to the Side, as Shown Here, and Dumps the Hay Well Over to the Side of the Loft, So That It Requires No Hand Distribution

The hayfork, which lifts hay from the wagons to the haymow, has been one of the greatest labor savers on the farm and it is now supplemented by a "mower," a machine which distributes the hay in the loft and so eliminates one of the most disagreeable parts of the work. The mower consists of a board platform swung from the middle of a steel frame in the loft. As the hayfork brings up a load, the mower moves under it, receives the load and moves along the barn on a double track to the point where the hay is to be deposited. It then tilts, to one side or the other, and dumps the hay in the desired spot. The operation is accomplished by means of ropes. The mower turns completely over in dumping and can be stopped at any point desired.



The Mower Receiving a Load of Hay from the Fork Which has Lifted It from the Wagon to the Loft: Its Use Makes the Whole Operation Mechanical



At the Right the Truck is Seen Backing into Place Preparatory to Digging the Hole for the Pole Lying on the Ground. This Shows the Auger Swung to the Side. At the Left the Auger Is in Position Ready to Begin Boring. The Hole will be Completed in from One to Four Minutes, Depending on the Kind of Soil

ERECTING FIFTY TELEPHONE POSTS PER DAY

By FRANK B. HOWE

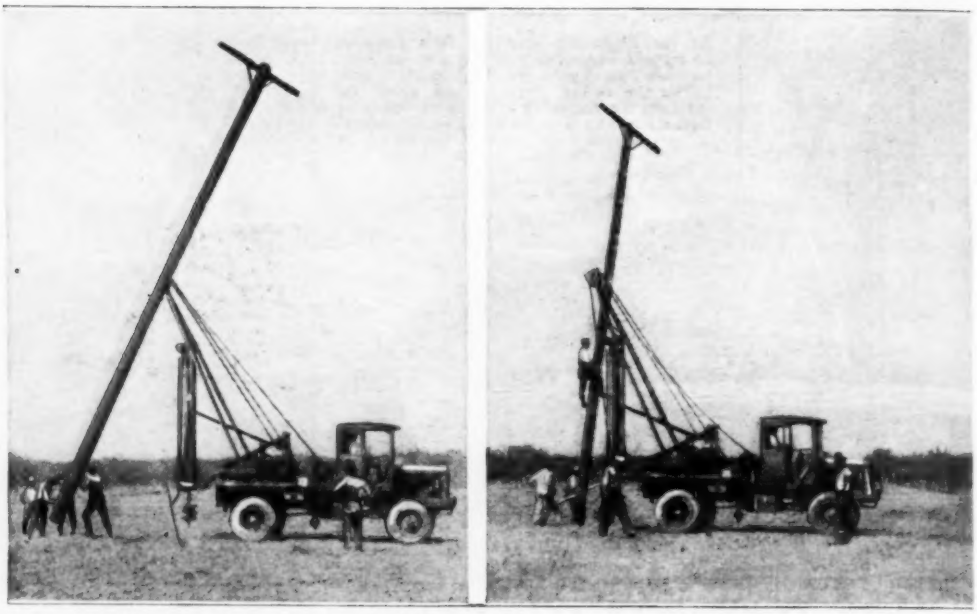
A MACHINE that starts out in the morning and returns at night after having dug the holes for, erected, and completely set up 50 telephone poles, with a crew of only four men, is used by a California electrical corporation.

An auger at the rear of an automobile truck is so connected to the truck engine that the latter, by the throwing in of a clutch, operates the auger. Augers of various sizes are interchangeable.

Above the auger and its mechanism is a derrick and cable, also operated by the truck motor, which picks up the pole, places it in the hole, and holds it there. The bed of the truck is arranged to permit the auger to swing around to a 45° angle, thus enabling the easy placing of the boring apparatus at the exact spot where the hole is to be bored. A crew of surveyors precedes the pole-erecting gang and drives stakes at the points where the poles are to be erected. The poles are delivered and all is then in readiness for the erecting crew. The truck backs up to the first hole, places the auger above the stake, and the work begins. The auger bores only a little way down at a time, is then stopped and lifted straight up. Thus the dirt is lifted out of the hole at the same time on the flanges of the bit. The bit is then whirled and the dirt falls off, not back into the hole but, because of the whirling motion, beside the hole. In this manner, the bit is worked up and down until the hole is deep enough. From one to four minutes is required

The Auger Bores Only a Little Way Down, and is Then Lifted Straight Up. Thus the Dirt is Lifted Out of the Hole, a Little at a Time, and the Boring Is Easier

The Bit is Then Whirled and the Dirt Falls Off, Not Back into the Hole but, Because of the Whirling Motion, beside the Hole



When the Hole has been Dug, the Power is Shifted to the Derrick and a Cable Placed around the Pole; the Engine is Started, and the Pole is Lifted into the Hole. Four Men with Hand Poles Then Straighten Up the Pole in the Hole; the Dirt is Filled In, and the Crew and Machine Proceed to the Next Post

to complete the hole, depending upon the kind of earth encountered.

The power is then shifted to the derrick and a cable placed around the pole; the engine is started, and the pole lifted into the hole. Four men with hand poles then straighten up the pole in the hole; the dirt is filled in, and the crew and machine proceed to the next post.

The expense of operation consists of the small amount of gasoline required to run the truck's motor. To figure the saving, several elements must be taken into consideration. There is the saving of wages; four men do what a dozen formerly did, in about one-fifteenth of the time. There is the saving of time. And, still further, there is the absolute assurance that work will always be done with uniformity and accuracy.

FARTHEST-NORTH POLICE POST BEYOND THE ARCTIC CIRCLE

THE farthest-north police station in the world is located on tiny Herschel Island, in the Arctic Ocean not far from the mouth of the Mackenzie River. It is one of the posts of the famous Royal North West Mounted Police. Recently one of the three men stationed there was absent for a year without word being received from him. He returned safely with an Eskimo murderer he had set out to capture.

BUREAU WILL FURNISH PLANS FOR SMALL-HOME BUILDERS

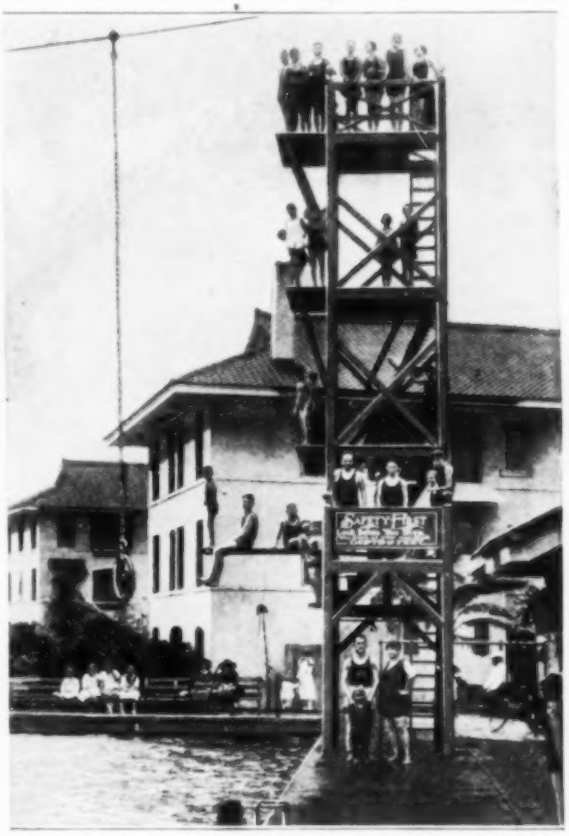
For the benefit of the small-home builder who cannot afford the cost of individual planning by an architect, there has been incorporated the Architects' Small House Service Bureau of the United States. The enterprise was started by a group of architects in Minneapolis, Minn., and up to the present the organization covers only the northwestern states, but there are in course of formation regional bureaus in other parts of the country. Much more complete plans and specifications for small homes than are otherwise available to their builders have been prepared, and the idea is to market these through the bureaus in much the same way as a wholesale clothing manufacturer markets his goods. On account of the wholesale nature of its business, the bureau will be able to afford the employment of the very best architectural talent available. The plans are for houses of from two to six rooms, just the type of work that an individual architect cannot furnish at any price that the small builder could afford to pay. Artistic designs will be furnished in the form of blueprints covering all details, together with full material lists, for every branch of the work, for the general contractor and for each subcontractor. The average cost for such a set of plans and specifications will be about $35 to the individual home builder. The bureau is indorsed by the American Institute of Architects.

POST-OFFICE EMPLOYES ARMED TO STOP MAIL ROBBERIES

Since the Post-Office Department took action to stop mail robberies by arming the postal employes, the number of robberies and amount of loss have greatly decreased. In New York City, where about $50,000,000 is handled daily, 500 revolvers, 50 shotguns, and 20,000 rounds of ammunition were issued. In Chicago the figures were: 1,700 revolvers, 500 riot guns, and 102,000 rounds of ammunition. Schools of instruction in the use of firearms were opened throughout the country.

SAFETY-FIRST DIVING TOWER MAINTAINS CLEAN RECORD

Though many thousands of people have dived from the four platforms of a diving tower at one of the popular outdoor swimming pools, at Balboa, in the Panama Canal Zone, the management boasts that there has never been a fatal accident. The pool is, of course, carefully supervised, and a large sign is conspicuously placed on the side of the diving tower where no one can fail to see it. This sign reads "Safety First. Look Before You Dive," and tells the depth of the water, so that divers need not depend upon guesswork to regulate their diving.

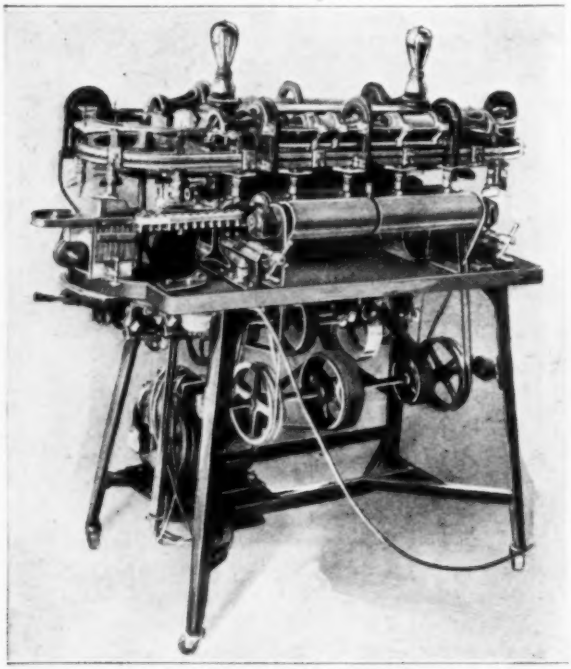


The Diving Tower Is Always Popular with the Crowds at the Pools and Beaches, and Its Popularity Makes It Difficult to Maintain as Perfect a Safety Record as That of This Tower at Balboa, Canal Zone

¶ The Canadian government is contemplating the installation of a powerful wireless station near Vancouver to handle land and coastal traffic, and thus leave the Point Grey station free for shipping traffic only.

NEW RAZOR-BLADE SHARPENER HAS AUTOMATIC FEED

A new razor-blade sharpener in which the blades enter and leave continuously, is the latest development in that kind of appliance. The new machine comprises a mechanical feeding device which places the blades where they can be reached by the jaws of constantly passing carriers. These carriers are attached to a continuous belt, running around the machine, and bringing the blades opposite the honing and finishing rollers. To bring the blades into proper contact with these rollers, an oscillating motion is imparted to the carrier. More than 10,000 blades can be sharpened in a single 10-hour day by the machine.



The Small Carriers above the Rolls in This Razor-Blade Sharpener Bring the Dull Blades into Contact with the Latter. The Operation Is Continuous

DISAPPEARING SHOPS PROPOSED FOR NEW THEATER FRONT

In building a new theater in Auckland, New Zealand, disappearing shops for the building front are being seriously considered. The idea is to lower each shop into a well at night, thus making their roofs part of the floor of the theater vestibule. The building site has already been purchased.

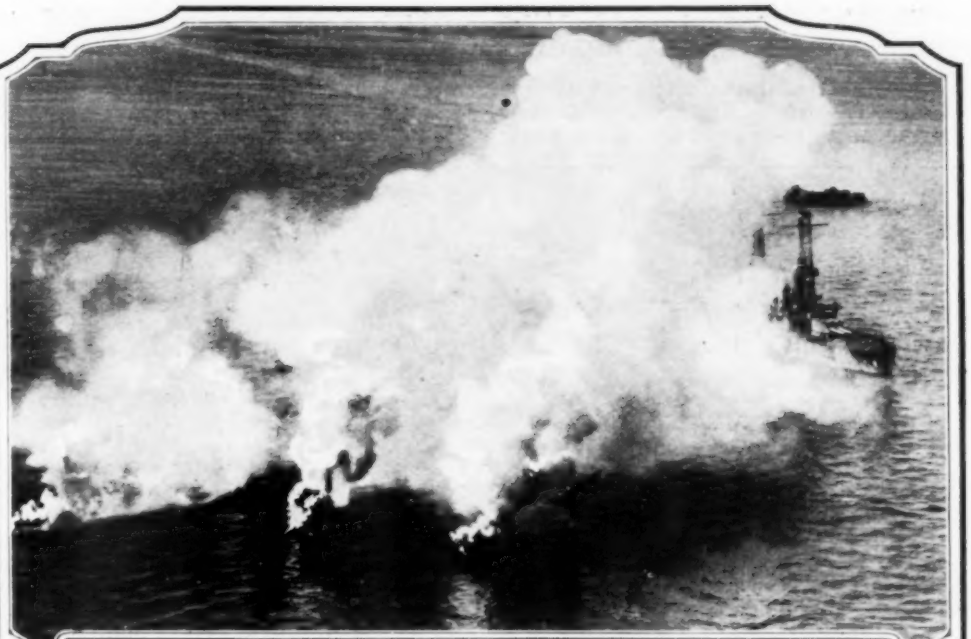
EXPERIMENTS AID PREVENTION OF GAS POISON IN MINES

Valuable progress has been made by the Pittsburgh Experiment Station of the Bureau of Mines, in developing methods of quantitative estimation of carbon monoxide in the blood, to assist in the prevention and treatment of carbon-monoxide poisoning among workers in mines and metallurgical plants. The work involves color comparison to distinguish the characteristic cherry-pink discoloration of the oxyhemoglobin, that is, the coloring matter of arterial blood. This coloring matter in a diluted solution is a pale straw color, but upon exposure to carbon monoxide becomes cherry pink. For this work testers must have eyes most sensitive to faint pinks. Twenty-four pairs of test tubes, containing solutions, discolored by absorption of carbon monoxide and with dilute indigo carmine in varying degrees, were placed in specially designed boxes so that observations could be made under uniform conditions. By testing a large number of persons as to their ability to determine which tube of each pair contained the more cherry pink, a "norm," or standard, of normal human performance, was established with which individual testers can be compared at any time. This standard was used in selecting the persons to be employed in the research work.

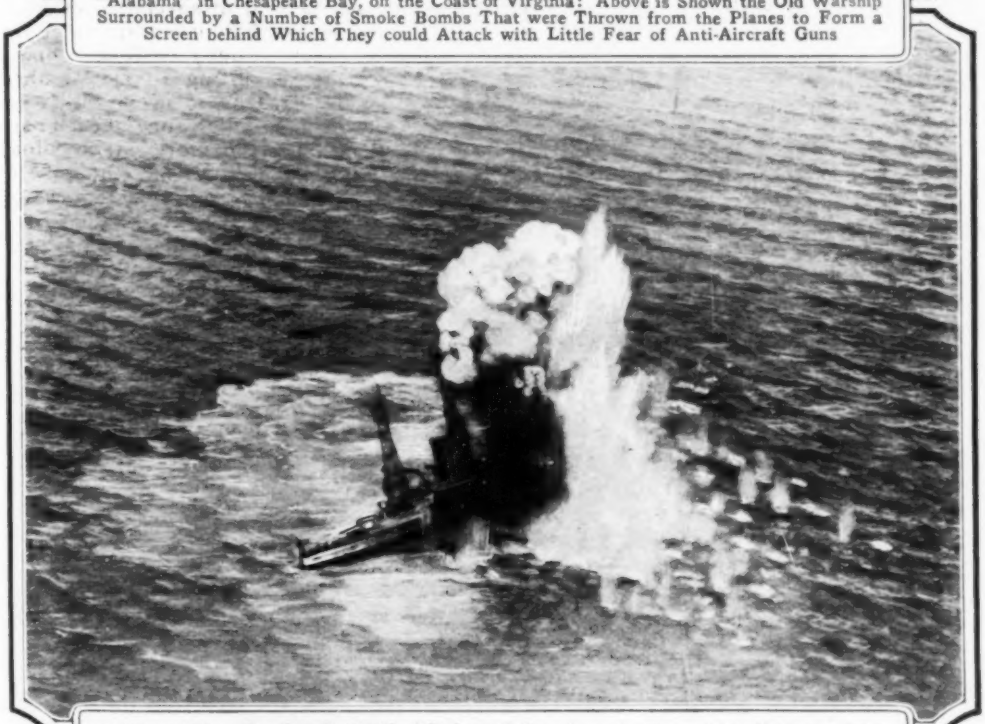
SPEED RECORD ESTABLISHED IN FRENCH AIRPLANE RACE

Covering the 300-kilometer course—187.5 miles—in 1 hr. 4 min. 39⅕ sec., George Kirsch won the Deutsch de la Meurthe cup and established a new world's speed record last month. Two other French fliers competed, one of whom, Sadie Leconte, the former record holder, broke his propeller and was forced to abandon the race. The Italian and English competitors also suffered accidents which forced them out. The winning machine was a Nieuport-Delage monoplane with a 300-hp. Hispano-Suiza motor. The nature of the accidents which occurred seems to indicate that 300 kilometers an hour is about the maximum speed of which an airplane, as at present built, can withstand the strain.

BOMBING TESTS ON OLD BATTLESHIP "ALABAMA"



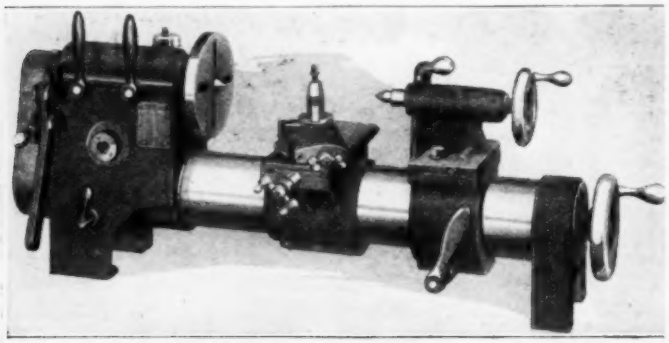
Pictures from Photographs Taken from Airplanes of Attacks upon the Old Battleship "Alabama" in Chesapeake Bay, off the Coast of Virginia: Above is Shown the Old Warship Surrounded by a Number of Smoke Bombs That were Thrown from the Planes to Form a Screen behind Which They could Attack with Little Fear of Anti-Aircraft Guns



A Direct Hit: The Old Battleship "Alabama," Struck at the Base of Its Mainmast by a 2,000-Pound Bomb, Dropped from the Air from One of Seven Martin Bombers That Took Part in the Tests. The Photo was Taken from an Army Airplane. A Little Later the Old "Alabama," Once the Pride of the Navy, Turned upon Its Side in the Shallow Water

PORTABLE ROUND-BED LATHE WITH WIDE-RANGE CAPACITY

A round-bed lathe, designed to give portability with a wide range of capacity and great sturdiness, is now on the market. The motor and the headstock are a unit. Inclosed in the headstock is a system of transmission gears that give five selective speeds, the highest being 915 r.p.m. The round bed is ground and pressed into the headstock, making it very rigid and durable. The tailstock is keyed at the bottom of the bed, and has a means of alining and clamping it at any point along the bed. The carriage feed, compound rest, change gears, tailstock top, and tailstock feed are all of standard construction. The hand-feed wheel is located at the end of the bed, where it is out of the way, yet within easy reach. The motor can be run from any standard light or power circuit. The lathe is specially adapted for technical-school work, or for any place where exceptional portability, combined with accuracy and speed, are needed.



Round-Bed Lathe That Is Compact and Portable, with Motor and Headstock, Including Transmission Gears, Built as a Unit: The Carriage Has Compound Slides, and Swivel Graduated to 90 Degrees

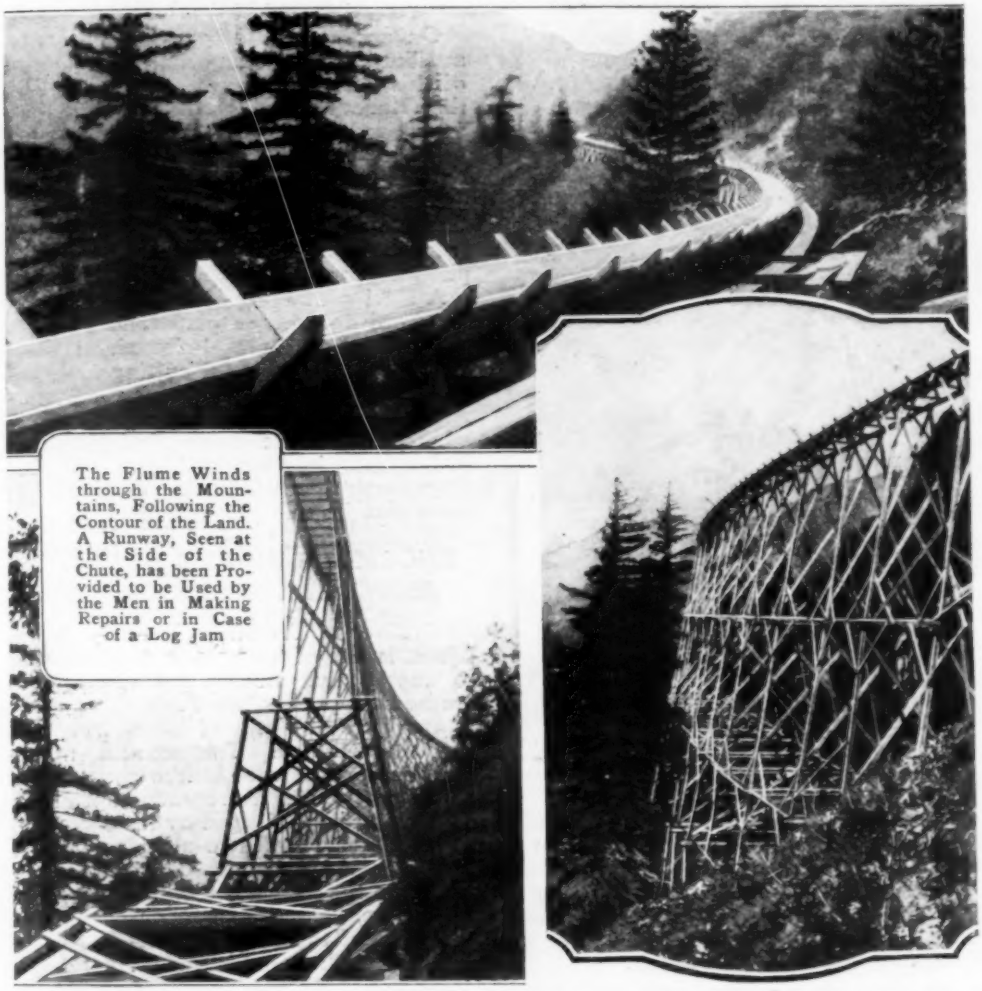
SNOWPLOW THAT IS PUSHED BY TRACTOR

A tractor-propelled snowplow has been developed in northern Michigan for use on snow-swept northern roads. It is operated by two men controlling the individual units of plow and endless-tread tractor. It is a huge affair with a "wing" spread of 12 ft., throwing the snow 6 ft. to either side. On each side of the forerunning sled is a large plowshare which turns the snow. Set at any desired angle are outboards which carry the snow to the sides of the road. The plow unit is adjustable for height by means of screws turned by handwheels. A windlass controls the steering runners. It makes a road suitable for motor traffic, or for sleighs of any width.

Snowplow in Front being Pushed by the Tractor Behind: The Man on the Plow Sets the Outboard and Another Man Runs the Tractor

Front View of Snowplow Pushed by a Tractor: A Plowshare on Either Side Throws the Snow onto the Outboard behind It

FLUME BUILT ALONG COLUMBIA-RIVER CLIFFS



The View at the Left Shows the Method of Construction, a Dangerous Task on the Precipitous Mountainsides, Requiring Great Skill and Daring, and Accomplished by a Few Picked Workmen. At the Right Is a Giant Trestle, Supporting the Flume across a Deep Valley

A nine-mile flume, with a half-mile drop, built between Willard and Hood, Wash., the southern end of which winds along the steep cliffs on the north bank of the Columbia River, is one of the most difficult pieces of construction ever undertaken in the lumber industry. In skirting the cliffs, the work was all done by a few daring and skillful climbers. A small mill was built in a fir forest at the upper end of the flume to cut the lumber used in construction. The lumber was floated down the partly built flume to the point where needed. Heavy timbers serve as the base of the structure, blocked up at either end to give a level surface. From these rise posts made secure by cross timbers and bracing. A short length at the top forms a cap holding the main bed of stringers, the bracket, and the V-shaped flume box. About 1,500,000 ft. of lumber were used. The water which floats logs down the flume forms an artificial lake for receiving the logs at the mill below. About 600,000,000 ft. of fir logs will be floated down this flume.

¶ The Swedish government has subsidized the manufacture of peat bricks for insulating and packing walls and floors of buildings. They will reduce the cost of insulating material about 60 per cent.

UNSINKABLE HUNTING BOAT BUILT LIKE CATAMARAN

Steadiness is probably the most essential feature in a boat designed for use in duck hunting. The maximum of steadiness is combined with lightness in a new

WIDE WORLD PHOTOS

The Catamaran Hunting Boat in Use: This Style of Boat Furnishes the Steadiness Which Is So Necessary for Good Shooting at Flying Ducks

unsinkable boat for hunters. It is built on the principle of the catamaran. Two small hollow pontoons are connected by a seat which accommodates the single passenger of this novel craft. Footrests near the end of each pontoon serve as braces in rowing and shooting.

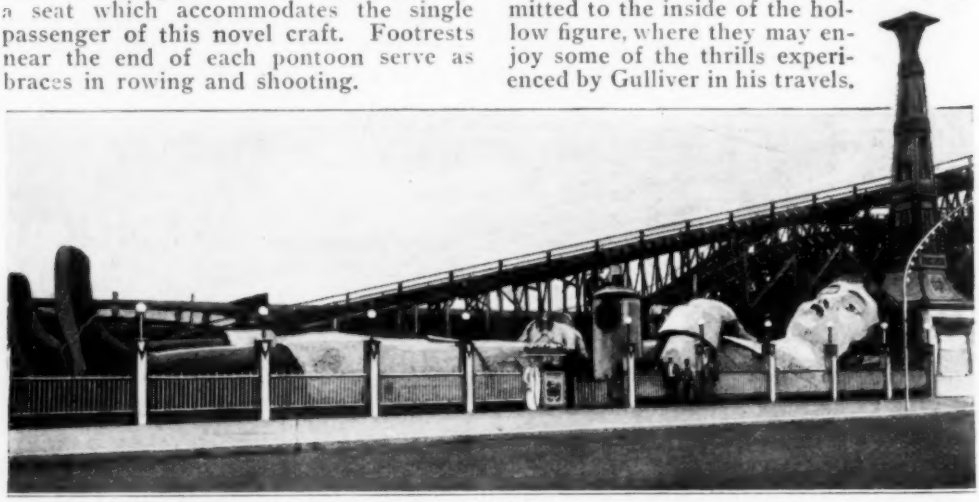
"MYSTERY METAL" HAS MANY PRACTICAL USES

On account of the strange properties attributed to zirconium, an investigation of this substance has been conducted by the Bureau of Mines. Zirconium is found most abundantly in Norway and in Canada, but also occurs in the United States. It is a white metal, having a high melting point and is very resistant to the action of acids. For this reason it has been suggested as a substitute for platinum for crucibles, and like apparatus.

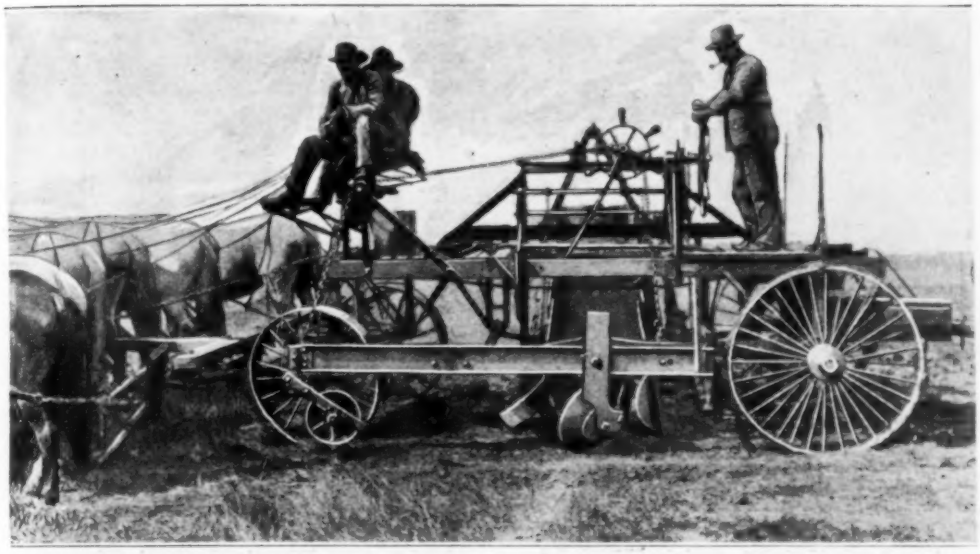
A steel containing zirconium has been proposed for armor plate and automobile parts, and nickel-zirconium alloys have been suggested for cutting tools and cutlery. Being absolutely nonpoisonous, zirconium oxide is finding use in paints, where its resistance to physical and chemical agents is proving highly valuable. Experiments are also being conducted to determine its utility as an abrasive.

ENORMOUS FIGURE ATTRACTS AMUSEMENT-PARK CROWDS

"Gulliver's Travels," Revere Beach, Mass., is one of the most recent attempts to supply that novelty so essential in amusement-park attractions. An enormous figure of Gulliver, 125 ft. long, has been constructed. The wooden framework is covered with stucco and painted to appear lifelike. A reproduction of the huge stone jug, salvaged by the legendary traveler when forced to abandon ship, is used as a ticket booth. Patrons are admitted to the inside of the hollow figure, where they may enjoy some of the thrills experienced by Gulliver in his travels.



The Effect of This 125-Foot Figure Fronting the Beach Is Rather Startling When One Comes upon It Unexpectedly, but It Proves to Be Merely the Housing for the Harmless Thrillers of the Amusement Park at Revere Beach, Massachusetts, Where It has Become Popular with Holiday Crowds



Elevating Road Grader That Digs the Soil by Means of a Rotary Disk in Place of the Usual Plowshare: The Disk Is 24 Inches in Diameter. It can be Seen How It is Bolted and Clamped to the Grader Frame

ROTARY-DISK PLOW REPLACES SHARE ON ROAD GRADER

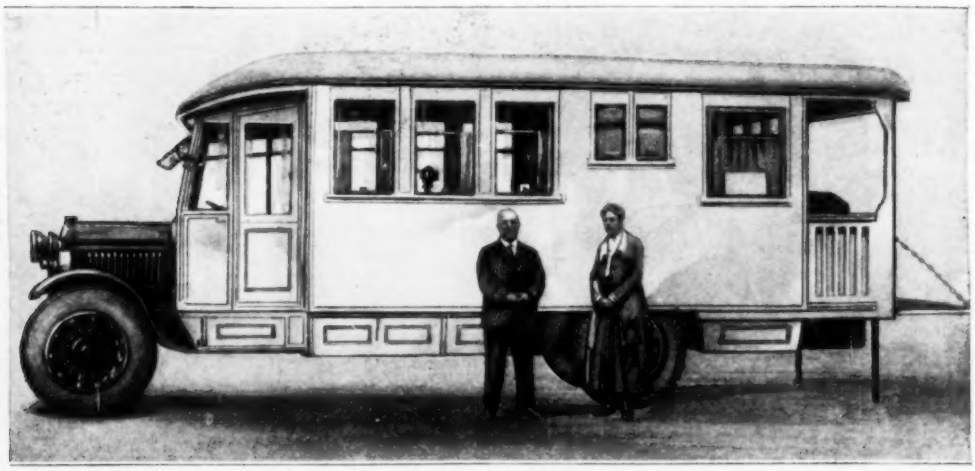
In elevating road graders, operated by throwing the dirt onto a belt conveyor which carries it to the other side of the grader and dumps it into a wagon driven alongside the grader, the usual means of digging the soil has been a common plowshare. In a recent invention this is replaced by a rotary-disk plow, which, it is claimed, is much more efficient in handling light soil, sand, or gravel. The disk is 24 in. in diameter, and rotates on ball bearings in a dustproof housing. It is attachable to any make of elevating grader.

INSTRUMENT THAT IS USEFUL IN STEEL HEAT TREATMENT

A recently invented instrument for measuring the temperatures of heated objects, such as a piece of steel made hot for tempering, is based upon the principle that the intensity and quality of the radiations from hot objects vary with the temperature. In the heat treatment of metals it detects the temperature necessary at each stage of any process. The instrument, of English invention, is in the form of an eyepiece that is either monocular or binocular, and that shades the eye from all external light. It has a pair of cells, well protected by caps, containing different dye solutions, that are interchangeable, and are readily detachable. Each dye solution makes the hot object visible at a certain temperature, and by looking at the object, first with one and then with the other in place, the correct range of the temperature—as in casehardening steel, for instance, between 1,650° F. and 1,700° F.—is observable.

Instrument That Measures Temperatures of Heated Objects by Means of a Dye Solution

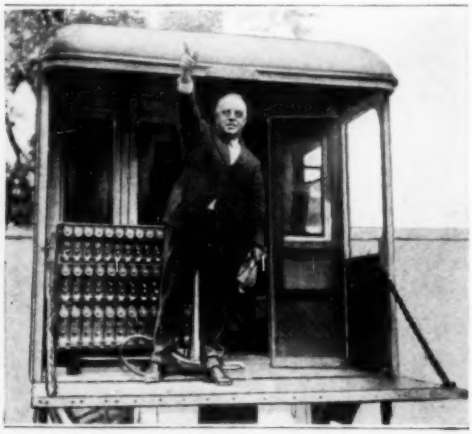
¶As a result of the industrial depression, the enrollment of the Homestead, Pa., high school in the steel-mill district, has increased to 998 pupils. The building accommodates 500 normally. It has been necessary to install study tables in the halls and establish "keep to the right" and "keep moving" rules.



The Reverend John Fulton and His Wife Standing beside Their Combined Home and Church: Comfortable Living Quarters are Provided in the Forward Part of the Machine, While the Church Occupies the Rear, with a Platform at the Back for a Pulpit

THE "CHURCH ON WHEELS" GOES TO THE PEOPLE

The Rev. John Fulton, of Harrisburg, Pa., and his wife have found a way to take the church to the people who cannot



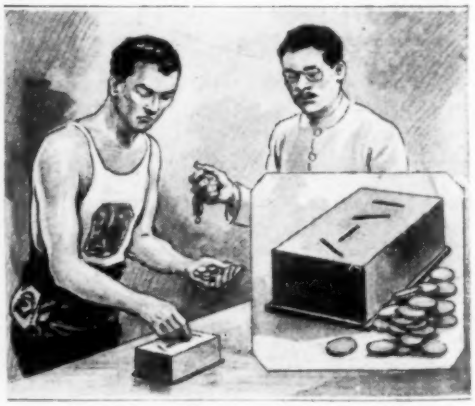
Preaching from the "Pulpit" of the "Church on Wheels," Which has been Parked by the Roadside for Conducting the Services

go to the church. Their combined church and home is mounted on a motor-truck chassis. The forward part contains comfortable living quarters, while a platform at the back serves as a pulpit.

The "church on wheels" is stopped at convenient spots along the popular highways, and services are conducted from the rear platform. These services are attended by motorists and by residents of the neighborhood who cannot easily get to any of the regular churches.

JAPANESE DEVICE FOR TESTING THE DEGREE OF FATIGUE

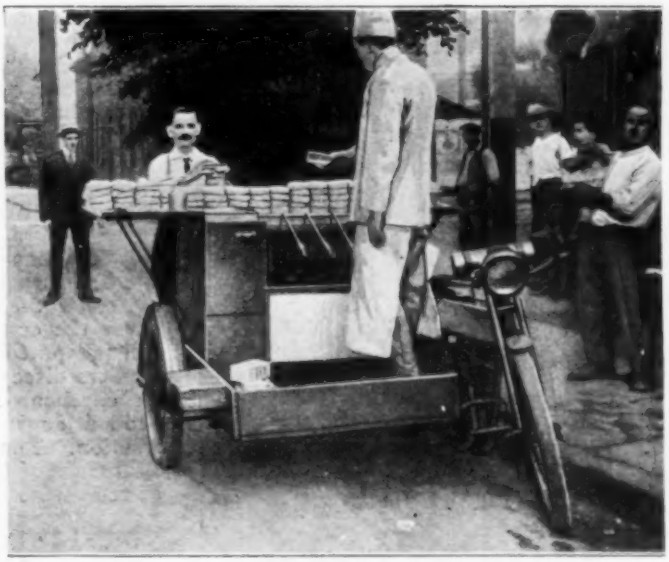
A curious device for determining how tired a person is, is being manufactured in Japan and used in the schools of that country in connection with physical training. The tester consists of a small metal box, with four slots, arranged at different angles, in the top, and 40 round metal slugs, about the size of a nickel. The person to be tested holds the slugs in one hand and with the other drops them into the slots, while being timed with a stop watch. The time required to drop all the slugs into the box indicates approximately the degree of fatigue the operation has caused in the person who is being tested.



The Japanese Method of Testing Fatigue, Said to Give Accurate Results: The Insert Shows the Metal Box and Slugs Which are Dropped into It

MOTORCYCLE STAND SERVES FOR SALE OF HOT WAFFLES

A Philadelphian has converted the side van of a motorcycle into a booth for the baking and sale of hot sugar waffles, by adding a stove and suitable compartments for supplies. When ready for business, the vender spreads freshly made waffles, wrapped in waxed paper, on the counter, which can be extended on both ends by hinged sections. The day's business done, it is a matter of only a few minutes to close up the outfit and ride home. The novelty of the idea boosts this man's waffle business.

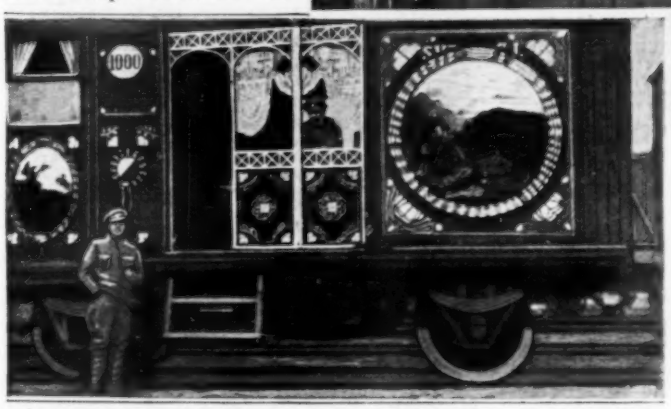


Quickly Set Up and Quickly Transported, This Open-to-View Motorcycle Outfit Yields a Handsome Return to the Hot-Waffle Vender, Who Introduced the Novel Idea into His Business

CZECHO-SLOVAKS DECORATE CARS WITH BARK

The Czecho-Slovaks found a great deal of time on their hands during the slow process of evacuating Siberia, and they employed it by decorating the cars in which they traveled. The most easily obtained material was bark, which they cut into small pieces and tacked on the cars, both inside and outside, to form pictures. These pictures are evidently clever reproductions of their former homes, and the mountain scenes surrounding them. They are not the only marks left by the artistic nature of the Czechs, however. Wherever they stopped long enough, they planted gardens, about which they built neat rustic fences.

This Picture of a Czecho-Slovak Village Tacked on the Side of a Railroad Car Expresses the Typically Artistic Nature of the Slavic People



Great Ingenuity was Required to Reproduce Such Scenes as This, Representing a Bit of Mountain Scenery, with No Other Material Than Bark

CONVERT PORTABLE GRINDER INTO CHAMFERING TOOL

Chamfering the four corners of a wooden post, or beam, has been very much simplified by removing the grinding wheel from any standard portable pneumatic or electric grinder, and clamping in its place a milling tool. In connection with this combination is a cast-iron right-angled guide block that rests on two sides of the wooden post, and is shaped at its apex so that it will drop down to the desired depth of the chamfer, and follow it as the tool cuts it. In this way the milling tool cuts a taper at the beginning and end of each chamfer.

Portable Pn umatic or Electric Grinder Converted into a Tool for Chamfering Wooden Posts by Replacing the Grinding Wheel with a Milling Tool, and Attaching a Right-Angled Guide

1920 MANUFACTURES WORTH NEARLY $63,000,000,000

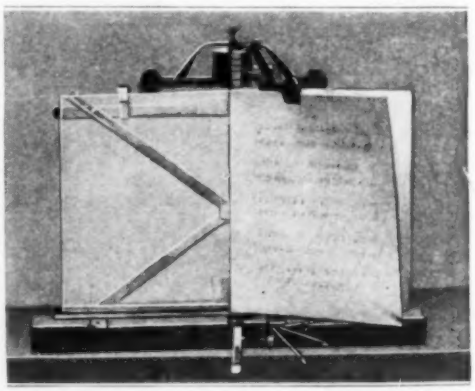
The report of the United States Census Bureau places the value of the manufactured products of this country for the year 1920 at $62,910,202,000. This figure is three times as great as that of 1910, and five and one-half times as great as the 1900 total. Thirteen states manufactured products valued at more than $1,000,000,000. New York was highest with $8,875,007,000, and Pennsylvania, Illinois, Ohio, Massachusetts, New Jersey, Michigan, California, Indiana, Wisconsin, Missouri, Connecticut, and Minnesota followed in the order named. There was an average of 9,103,200 wage earners employed in the 289,768 manufacturing establishments of the country during the year.

ROADS IN IMPERIAL VALLEY PAVED WITH RAW COTTON

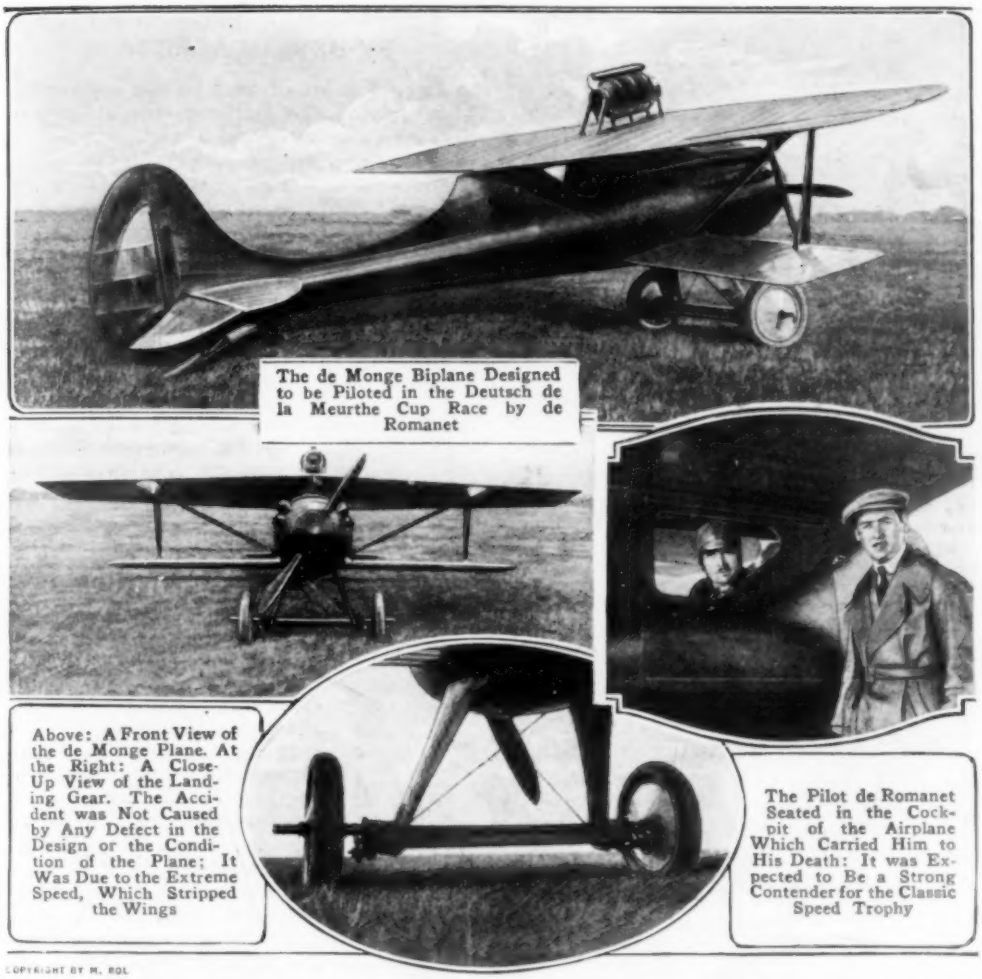
In the Imperial Valley, California, cotton has been employed as a road surface. Roads in the valley have been poor because the constant shifting of the sandy soil prevented the wearing of trails. The farmers discovered that raw cotton made an excellent road surface, cotton pods bedded down in the sand giving good traction. The cotton crops of 1919 and 1920 were of little value, and many miles of road were surfaced in this way.

MUSIC-SCORE HOLDER TURNS THE LEAVES AUTOMATICALLY

Turning the leaf of a piece of sheet music on a piano can be done so rapidly by a recent device that the pianist can, to all intents and purposes, keep both hands on the keys continuously. All that is necessary is to give a momentary touch to a small hooked bar that hangs below the music, and the leaf is automatically turned. This bar is connected to operating rods which trip spiral springs contained in a cylindrical housing at the center of the stand above the music, which are connected to pivoted horizontal arms, at the ends of which are small clamps for fastening to each leaf of the music. The tripping action causes the springs to rotate the arms, one after another, and thus turn the leaves in succession.



Music-Score Holder Turning a Leaf Automatically: To Operate It, the Pianist Touches the Small Hooked Bar below the Music at Its Center



The de Monge Biplane Designed to be Piloted in the Deutsch de la Meurthe Cup Race by de Romanet

Above: A Front View of the de Monge Plane. At the Right: A Close-Up View of the Landing Gear. The Accident was Not Caused by Any Defect in the Design or the Condition of the Plane; It Was Due to the Extreme Speed, Which Stripped the Wings

The Pilot de Romanet Seated in the Cockpit of the Airplane Which Carried Him to His Death: It was Expected to Be a Strong Contender for the Classic Speed Trophy

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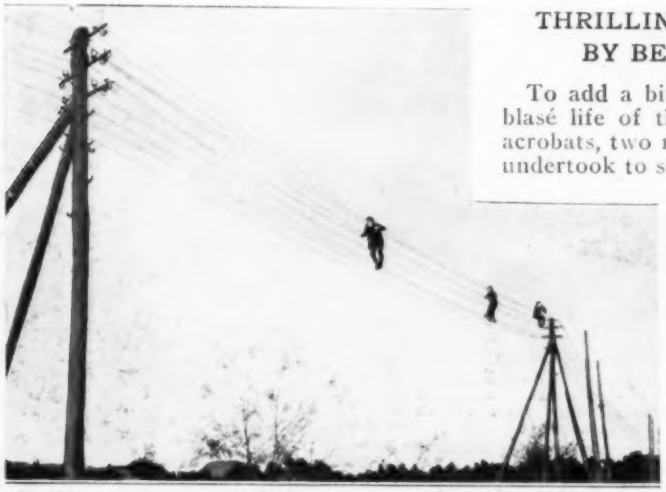
STRAIN FROM EXTREME SPEED WRECKS RACING AIRPLANE

The airplane which was to have been piloted by the airman de Romanet in the Deutsch de la Meurthe Cup Race was a biplane designed by the engineer de Monge. It was expected to be a strong contender for the classic speed trophy, but, during the week preceding the race, it crashed to the ground, killing the pilot, de Romanet. The plane had been considered a complete success and was in perfect condition before the fatal flight. Due to the strain of its extreme speed, the wing covering was stripped off.

¶A drydock is under construction at Esquimalt, B. C., to accommodate the largest vessels afloat. It will be 1,150 ft. long, 135 ft. wide, and 40 ft. deep.

DOUBLE-HEADED NAIL EASY TO DRIVE AND WITHDRAW

A double-headed nail is being manufactured that should be of advantage especially on forms for concrete, and other temporary wood structures. Of the compound head, the lower, or holding part, is much larger than a common nail head, making it possible to draw the boards together very tightly. The upper part of the head is always exposed and furnishes an easy means of extracting the nail, which can be reused many times.



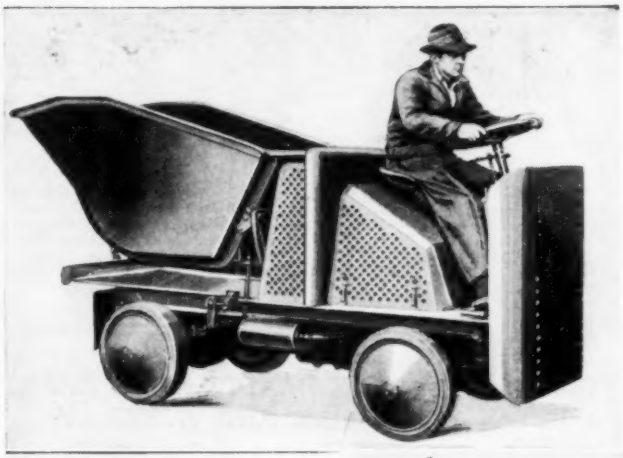
The First Man is Strolling Along, Supported by the Telegraph Wires; the Woman has Just Started Out, and the Other Man is Getting under Way

THRILLING STUNT ON WIRES BY BERLIN ACROBATS

To add a bit of zest to the apparently blasé life of the Berliner, three German acrobats, two men and a woman, recently undertook to stage a real thriller in a suburb of Berlin. The stunt consisted in balancing themselves on a set of telegraph wires and, while enjoying the scenery, thus walk from pole to pole, the latter being set about 150 ft. apart.

¶ The port of Manila, in the Philippine Islands, is to be equipped with a modern marine railway or drydock, with a capacity of 8,000 tons.

WAREHOUSE MOTOR TRUCK SERVES MANY PURPOSES



The Warehouse Truck-Tractor Equipped with a Dump Body: Other Types of Body are Also Supplied, as Well as Various Trailers

An industrial truck-tractor, designed for use in warehouses, on wharves, or wherever heavy loads must be handled in restricted quarters, performs the services of either a truck or tractor, as it is so constructed that bodies of various different types can be mounted on the one chassis. Powered by a 25-hp. engine, it will carry a load of 3,000 lb. or tow a maximum of 20 tons at a rate of 10 miles an hour on a level floor or street. The radiator is inclosed in a framework of sheet steel, and is to the rear of the engine, which arrangement amply protects the somewhat delicate part. On account of its 60-in. wheelbase and 36-in. tread, it is possible to maneuver or turn the powerful little machine rapidly in any space having a 10-ft. radius. Aside from the short frame and axles and the small wheels, all parts are standard motor-truck units.

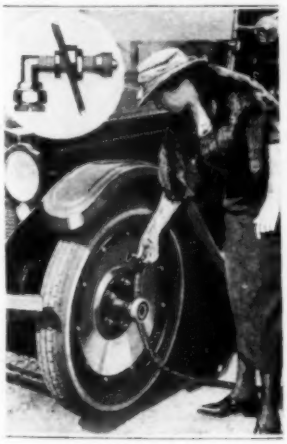
A Standard Gravity Dump is Used. By One Turn of a Crank on the Side of the Chassis, the Hopper is Released and Tips Back

UNIVERSITY STUDENTS BUILD CITY FOR OWN HOUSING

The University of Prague, which played an important part in the history of old Bohemia and is destined to play a still more important part in the development of the young Czecho-Slovak republic, is the center of a movement, on the part of the students, to build their own city. The incentive for the plan was the fact that 1,000 students were homeless immediately following the war—homeless because of the lack of rooms at moderate prices. The movement crystallized into real work in October last year, and from then until the end of December, when the first pavilion was completed, an average of 180 students were daily continuing the work. The city will consist of four pavilions housing 92 students each; six, housing 56 each, and a large central building somewhat on the lines of a big hotel.

HANDY VALVE EXTENSION FOR INFLATING DISK-WHEEL TIRE

Owners of automobiles equipped with steel-disk wheels will find the new right-angle valve extension a great convenience in inflating tires. It should be especially appreciated by women, as it makes it possible to inflate a tire from the outside of the disk. A simple extension valve, made in the shape of a right angle, is attached to the regular valve and protrudes through a slot in the steel disk. The air nozzle is placed over the end of the extension in the same way as on the ordinary valve.



SUPPLY CALIFORNIANS' NEEDS WITH READY-TO-USE HOMES

With the whole country attempting to solve the acute housing situation, Los Angeles tackles the problem for itself and vicinity with an almost instantly erected tent home. The house, which is 16 by 16 ft. in size, including a kitchen, bedroom, and dining room, can be put up ready for occupancy in 45 minutes, with connections for gas and electricity. The sides are made up of door sections, the upper panel covered with wire screens, and the roof is of tenting. These houses are being placed on vacant property or city-owned lots, and are comfortable even in midwinter in southern California.

This Tent Solves the High-Rent Problem of Southern California, Where the Mild Climate Makes Protection against Severe Weather Unnecessary. It Makes an Ideal Camping or Beach Home in Any Climate

40,800-FOOT ALTITUDE RECORD ATTAINED WITHOUT HARDSHIP

A new altitude record of 40,800 ft. was established by Lieut. John A. Macready, test pilot at McCook Field, Dayton, Ohio, on September 28, exceeding the former record, made by Maj. R. C. Schroeder, in the same plane, by 2,620 ft., but without suffering any of the same hardships. The flight consumed 1 hr. 47 min., all but a few minutes being required for climbing. Though numb from the intense cold, Macready was able to climb out of the plane unaided after landing. He was clothed in an electrically heated fur suit, with a special helmet and goggles treated with a gelatin preparation to prevent the collection of ice.

RATCHET INSTEAD OF WHEEL ON RAILROAD HAND BRAKES

In the handling of freight there is on most railroads considerable loss through claims for damage, and anything that

Ratchet Hand Brake for All Types of Freight Cars, That Leaves One of the Operator's Hands Free for Holding Himself onto the Car, and is Operated by Pulling the Lever Upward, So That the Harder He Pulls, the Firmer Is His Footing

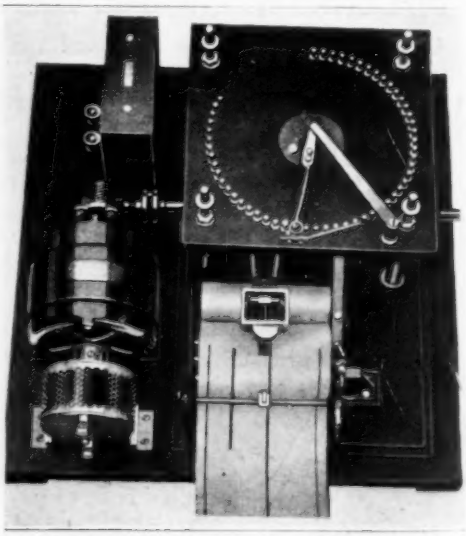
will give better control of freight cars will be a desirable development. Such an improvement is a new hand brake that operates more effectively, and with greater convenience and safety to the operator, than the ordinary wheel hand brake. Instead of by a wheel, it is operated by means of a ratchet with its working lever hanging downward. It is attached to the side of the car in such a manner that the operator stands at all times in a normal position. He has one hand free for holding himself onto the car, and the harder he pulls up on the operating lever with the other hand the firmer is his footing, so that he can exert his full strength without any fear of throwing himself off the car, as frequently is the case with existing hand brakes. The brake can be attached to any type of car.

4,250-MILE "AIR-TAXI" TRIP MADE WITHOUT ACCIDENT

What is reported to be the longest "air-taxi" trip ever made was completed at Paris, France, on September 15. The airplane was chartered for a business trip and left Paris on August 25. The trip included stops at Brussels, Amsterdam, Hamburg, Copenhagen, Stockholm, Christiana, Berlin, Warsaw, Prague, Vienna, Venice, Milan, Nimes, and Trieste, covering 4,250 miles without accident. The charterer said he had completed his business in one-tenth the time which would have been required traveling by train.

INSTRUMENT RECORDS MACHINE STOPPAGES AUTOMATICALLY

An instrument has been constructed in England to control the operation of 50 machines used in a large textile mill. This instrument records the stopping of any machine and the length of time that it is not running. Each machine is connected with the instrument in such a way that an electric circuit is completed when the machine stops. This causes a recording arm to make a series of marks on a paper chart, which is driven through the instrument at the rate of 6 in. an hour. The length of the series is proportional to the length of time during which the machine is stopped. As long as all the machines are running, the paper remains white. From the position and length of the lines, the machine and the time of its stoppage can be determined. An engraved celluloid scale is placed on the paper chart to assist in reading the



The Position of the Black Line Indicates Which Machine Stopped, and the Length of the Line How Long It Stopped

record of performance which it displays in graphic form.

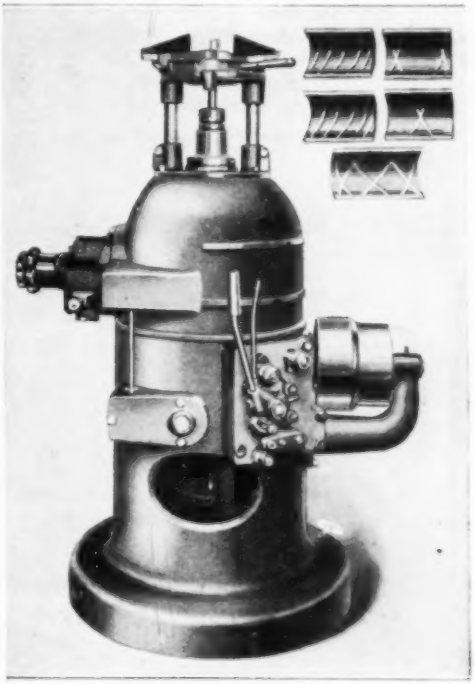
This Auto Sleigh was Used over the Ordinary Sleigh Roads of Alberta, Canada, with Complete Satisfaction. The Body was Made Narrow, to Fit the Narrow Sleigh Trails, and Seats Two Persons, One behind the Other. Traction is Secured by Placing the Driving Wheels Well Forward

MOTOR SLEIGH FOR WINTER TRAVEL IN CANADA

The heavy snows of Canada make the use of automobiles impossible in winter, but Dr. E. W. De Long, of Red Deer, Alta., refused to give up his car for the slow horse sleigh. He devised a motor sleigh and had it built from an ordinary automobile. Runners were fitted in the place of the front wheels and arranged to steer in the usual way. A wide flange attached to them keeps the front end up in loose snow. The driveshaft was shortened and the rear wheels brought up close to the engine to increase the traction. Back of these, another pair of runners was attached which can be raised clear of the road by means of a lever when additional traction is required.

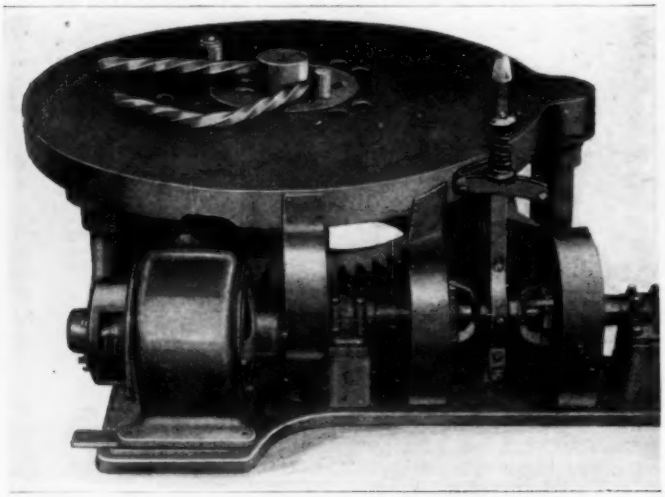
NEW OIL-GROOVING MACHINE FOR QUANTITY PRODUCTION

The cutting of every type of oil groove, particularly in bearing bushings, on a production basis, is done with rapidity by a new machine, specially designed for the purpose. Grooves are cut in $1\frac{1}{4}$-in. bushings 2 in. long, where they are simple, in as short a time as 10 seconds a pair, and where they are most complicated, in not more than 25 seconds. On a base of 24-in. diameter, the machine stands vertically, with its work-holding chuck at a convenient height for the operator. It may have tight and loose pulleys and be driven from a line shaft, or it may be driven directly by a $\frac{3}{4}$-hp. motor. In quantity production, all grooves are cut with an automatic feed, but it has also hand feed for working on small lots. It will accommodate various lengths of bushings, with diameters up to $4\frac{1}{2}$ in., while work up to 6 in. can be mounted on top of the chuck.



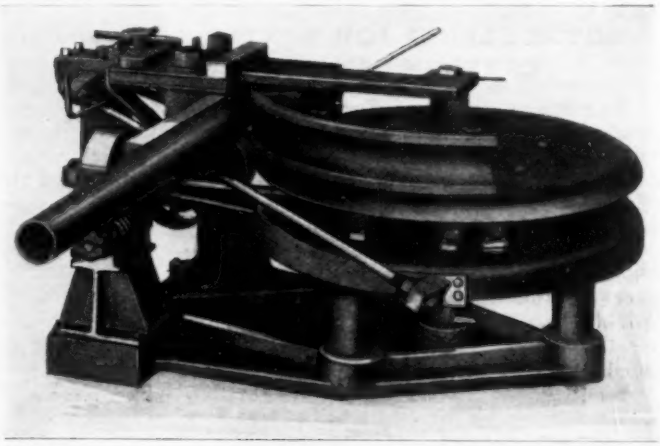
Machine That Cuts Oil Grooves in Bushings on a Production Basis: The Work-Holding Chuck at Top Is at a Convenient Height for the Operator

POWER-DRIVEN MACHINE BENDS PIPES AND BARS



Machine for Bending Reinforcing Bars in Large Quantities Rapidly: It is Driven by the Electric Motor at Its Base

Various forms of power-driven bending machines are now being produced that can be used for bending pipe, angle iron, reinforcing bars, and other similar objects. The pipe-bending machine has a forming die easily exchangeable to suit any radius of bend desired. This is grooved to fit the inside face of the pipe, and on the outside face is a grooved bar that follows the pipe through any angle of bending. The machine is operated by a lever which engages friction-clutch pulleys for both forward and reverse drive. The clutch is thrown out automatically at the end of the bending operation, and also again when the machine has been reversed and returned to its starting position. The machine for bending reinforcing bars is similar in principle, but is operated by a motor. Its special purpose is to bend these bars in large quantities very rapidly.

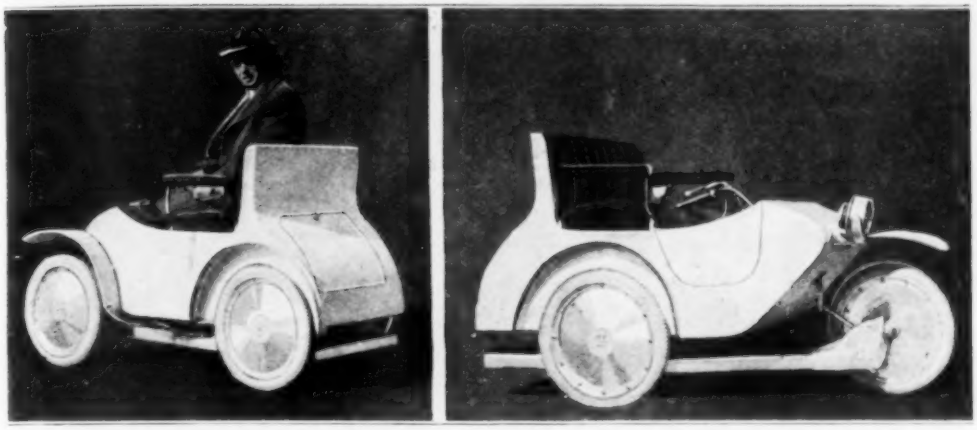


Machine for Bending Pipes, Fitted with Clutch Pulleys for Power Drive: A Pipe Is in the Machine Ready for Bending

For the Wheel-Chair Patients in an Adjoining Sanitarium, the College Hall has been Made Accessible by Means of This Concrete Incline, Which Affords an Easy Mode of Entrance

WHEEL-CHAIR PATIENTS ENTER HALL BY INCLINE

Visitors to the assembly hall of a college near Washington, D. C., see at the entrance, in addition to the broad flight of steps, a gentle incline that curves in the form of a "U" from ground to porch level. The structure is of reinforced concrete, about four feet wide. The college adjoins a sanitarium which always has as its guests a number of wheel-chair patients. Thanks to the incline these can enjoy the services in the hall, when they please.



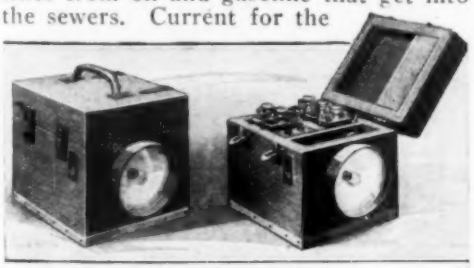
Left: The Front Wheel is Steered by Means of a Lever. The Transmission and Engine Are a Unit with the Left Rear Wheel. Right: The Third Wheel is Staggered Forward like the Wheel of a Motorcycle Sidecar. This Gives the Necessary Stability

SMALL MOTOR CAR RESEMBLES MOTORCYCLE WITH SIDECAR

A new type of small automobile which possesses an unusual feature in the arrangement of its wheels, is about to be manufactured. It has three wheels, two of which are in alinement on the left side of the car. The motor, a 5-hp. V-type, similar to a motorcycle engine, and the transmission are a unit with the left rear wheel. The third wheel, on the right side of the car, is staggered forward like the wheel of a motorcycle sidecar, to secure stability. The car seats two and can be provided with a weatherproof top. It weighs only 150 lb. It is capable of a speed of 30 miles an hour, and will run 75 miles on one gallon of gasoline.

SPECIAL LAMP DESIGNED FOR SEWER INSPECTION

The city of San Francisco has designed and built a special electric lamp so that inspectors and workmen in the sewers may have sufficient light without danger from the gas which collects in large quantities from oil and gasoline that get into the sewers. Current for the lamp is supplied by storage batteries placed in a box, which also holds the bulb and reflector, and has a handle for carrying. One charge of the batteries will last for about nine hours, more than enough for one day's work. A recharging plant has been installed, and the men call there each morning for their freshly charged lamps.

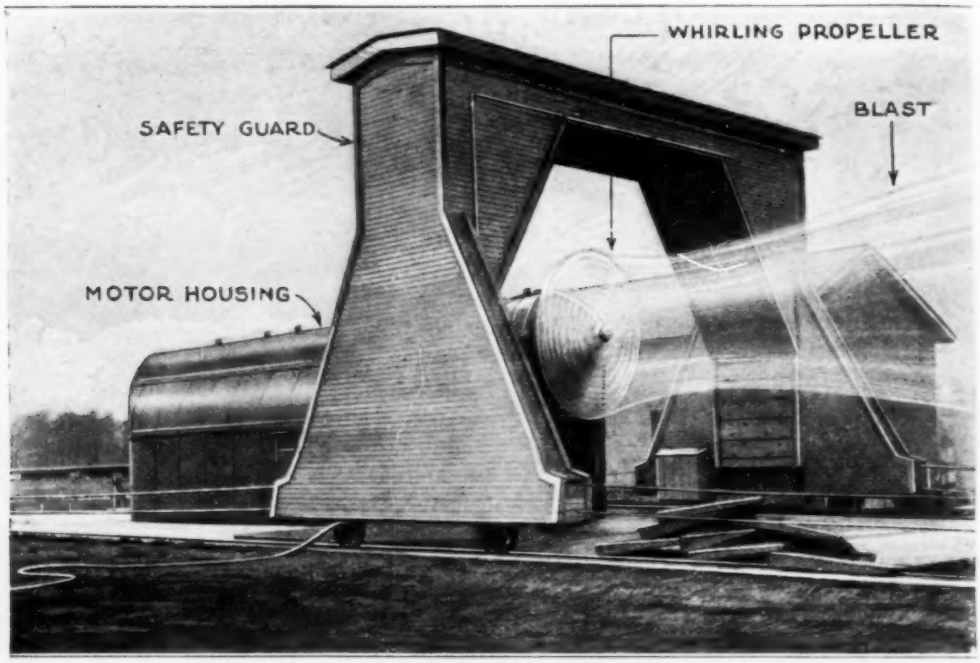


The Lamp and Batteries are Inclosed in a Small Box with a Handle on Top

LARGEST ICE-CREAM CAKE SERVES 2,000 PERSONS

Probably the largest ice-cream cake ever made was that supplied to a recent B. P. O. E. banquet at Tulare, Calif. It measured 26 by 32 by 18 in., contained 41¾ gal. of ice cream, and weighed 380 lb. To facilitate serving the 2,000 persons who shared in this huge cake, the interior was made of individual bricks. These were frozen in a wooden mold, and the exterior was decorated with colored whipped cream.

This Huge Cake of Ice Cream was Made to Serve 2,000 Persons. The Ordinary Dish of Ice Cream beside the Cake Gives a Fair Idea of Its Size

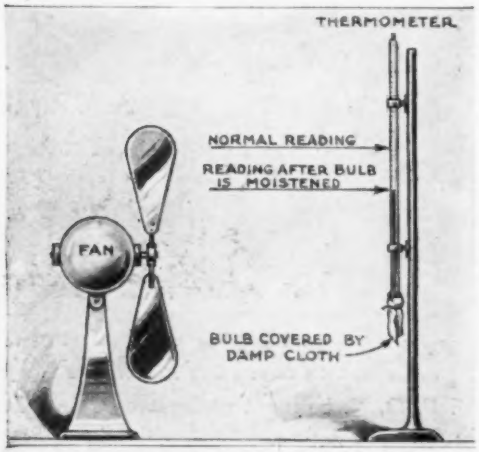


Blast from 800-Horsepower Airplane Propeller Made Visible by Moisture: Whirled in This Manner, the Propeller Corresponds to a Very Large Electric Fan. It is Seen That the Blast Resembles the Concentrated Stream from a Fire Hose. Its Shape is Preserved by the Action of the Spiral Vortices, as Shown Elsewhere

AERONAUTICS AFFECT ELECTRIC-FAN DESIGN

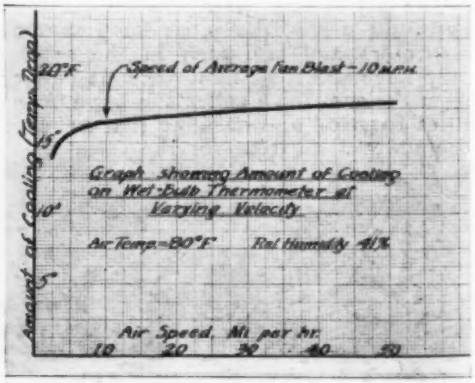
By CARL PALMBLAD

THAT the lessons learned in the aeronautical laboratory should have their application to such a simple everyday article as the electric fan, is perhaps not

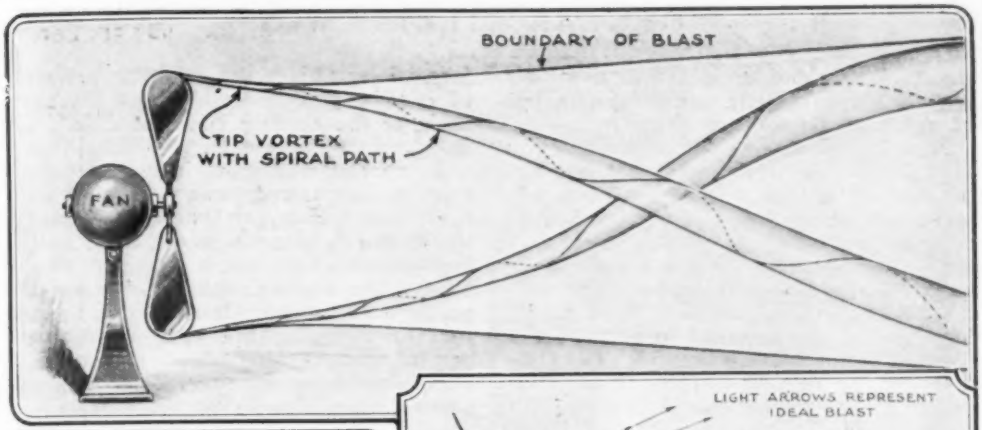


Homemade Cooling Test: On Revolving the Fan at Widely Varying Speeds, It will be Seen That the Reading on the Moistened Thermometer Remains at Practically the Same Reduced Value

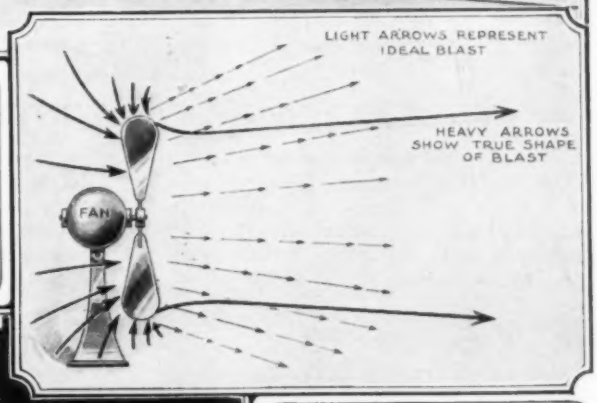
as singular as at first glance it would seem. The facts are, indeed, that the fan, as generally used for cooling purposes, is neither as hygienic nor as economical as it should be, and that this conclusion has been reached and the remedy found by the study of the current produced by air propellers. This current is of high velocity, concentrated in form like the stream of water from a fire hose; it is somewhat contracted after leaving the fan and surrounded by a "shell" of spiral vortices, generated by the propeller-blade tips, that maintain its shape. The ordinary high-

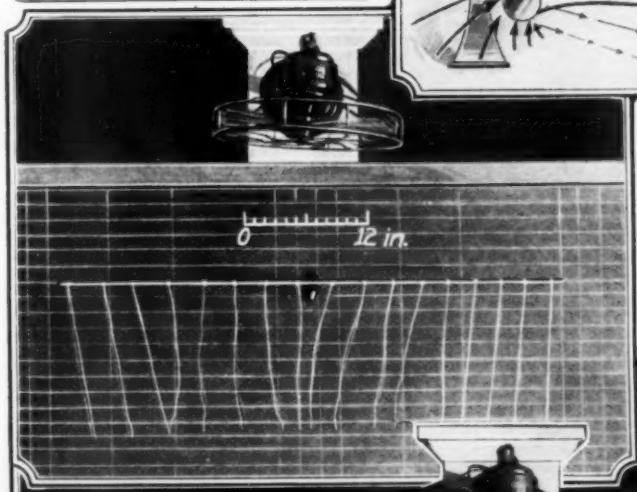


The Graph on This Chart Shows How Little Difference There Is between the Cooling Effect of a Fan Blast of Five Miles, and One of 50 Miles an Hour

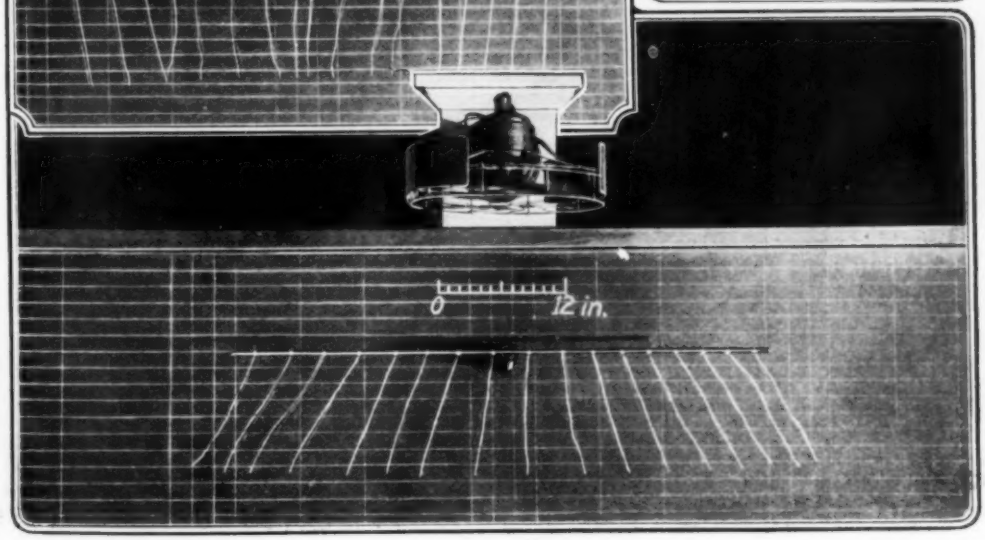


Above: Diagram Showing the Spiral Vortices Generated by the Blade Tips of an Ordinary Electric Fan. This Results in a Concentrated Blast, Similar to That Made Visible by Moisture, Which is Shown in the Illustration of the 800-Horsepower Airplane Propeller. This Undesirable Form of Blast is Shown to the Right in Comparison with the Ideal Diffused Blast Indicated by the Light Arrows





Testing by Means of Silk Threads, beside a Scale in Inches, the Nature of a Fan Blast: The Direction in Which the Threads are Blown by the Blast Indicates Clearly Its Shape. To the Left Is the Concentrated Air Flow from a Conventional Fan. Below is Shown a Diffuser Fan of the Improved Type, Diverging the Threads in Fanlike Shape



speed electric fan creates a similar "air jet" of comparatively great velocity but of small cross-sectional area.

Here it is that the error in construction lies; for it has been found that, for the purpose of cooling, a slow-moving but more voluminous mass of air has practically as great an effect as the narrower high-speed stream. In other words, the vanes of the fan should produce a "diffused" stream, of sufficient speed barely to penetrate the clothing so as to aid in hastening the evaporation of the moisture on the skin in hot weather. This evaporation—applied in a number of forms long before the scientific principle of cooling was understood—is the chief basis of the cooling effect of a fan, not its speed.

This being the case, it becomes self-evident that the diffusing fan will consume less power, and besides eliminate the distinctly disagreeable feature of the high-speed fan, in that it often, not to say always, plays havoc with loose documents on the office desks. It is also to be said for the diffusing fan that it does not create strong drafts, which may have ill effects on persons sensitive to such exposure.

TENT HOUSES HAVE WINTER "OVERCOATS"

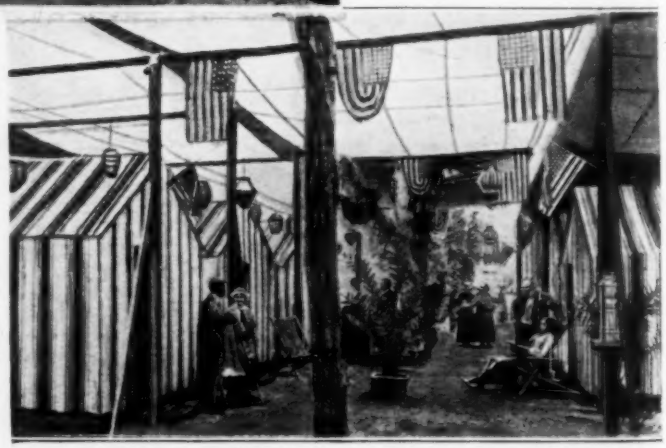
Tent houses are particularly to be desired in the summer because of their coolness, but the same quality makes them not only undesirable, but positively uninhabitable in severe winter weather.

The "Tent City" as It Appears in Winter When the Houses have Donned Their "Overcoats" in the Form of Wallboard Sheathing

Not wishing to let the hundreds of tent cottages in his "tent city" lie idle during the winter, one enterprising proprietor of such an establishment on Catalina Island, Calif., has evolved a system of "overcoats" for the tent cottages, whereby he utilizes his canvas dwellings in the winter as well as summer.

One of the several varieties of wallboard is used as the basis of the overcoat. This is nailed to a wooden framework in such a manner that it can be removed if desired. The canvas cottage remains beneath this outer layer. Openings are left in the wallboard for about 18 in. all around the cottage the canvas furnishing sufficient protection for this narrow strip, and at the same time permitting ample ventilation. A shingle roof also is provided with the overcoats and rests upon the top of the side sections.

¶A ten-year monopoly to operate motor busses in Spain has recently been granted a British subject. Previously there has been no service of this kind. The company is capitalized for $5,600,000.



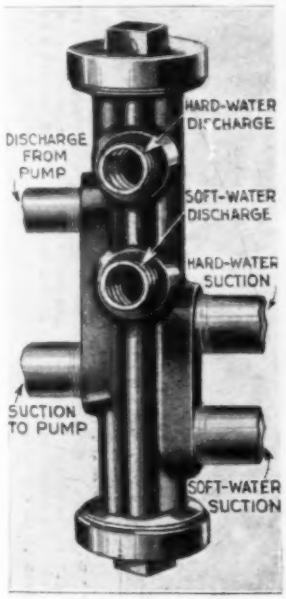
The Tent City as It Appears in Summer, with the Canvas Walls of the Dwelling Houses Not Yet Covered by Their Winter Overcoats

RADIO STATION IN GREENLAND TO AID WEATHER FORECASTS

It is expected that the high-powered radio station being erected in Greenland, by the Danish government, will be of great service in making daily weather forecasts for the eastern part of the United States, the north Atlantic Ocean, and Europe. There is an important relation between the atmospheric conditions in Greenland and these regions. For example, reports, received too late for forecasting, showed that during the severe winter of 1917-18, in the eastern United States, the pressure was greatly above normal on the west coast of Greenland.

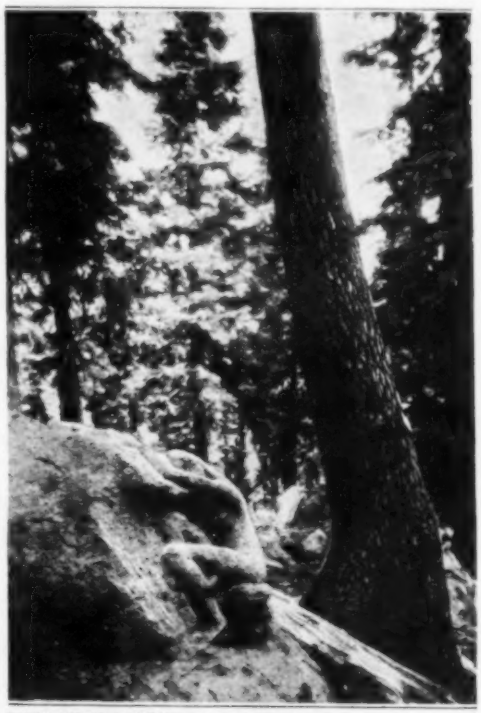
HARD AND SOFT-WATER SERVICE WITH ONE PUMP

In domestic water-supply systems, up to the present, in order to have an entirely automatic service of both hard and soft water, it has been necessary to have two pumps — one for the hard-water well, and the other for the soft-water cistern. Now this service can be supplied automatically with one pump fitted with a patented double-acting valve. This valve is cylindrical in form. It has six openings: two on one side are to the inlet and outlet openings of any pump: two, at 90° from these, are to the hard and soft-water discharges, and the other two, at another 90°, are for the suction pipes to the hard and soft-water supplies. In the barrel of this cylinder are three pistons made to operate as a unit, sliding up or down freely, being moved one way or the other according to the direction of the greater pressure, and automatically closing the ports so that when water is drawn from a soft-water faucet the hard-water ports are closed, and vice versa.



STATUE CUT IN ROCK FOUND AT CRATER LAKE, OREGON

In a remote corner of Crater Lake National Park, Oregon, a party of campers recently discovered a life-size figure



COPYRIGHTED, UNDERWOOD PHARMACY, KLAMATH FALLS, OREGON

This Figure, by an Unknown Sculptor, was Discovered in Crater Lake National Park, Oregon. It has been Called "The Spirit of the Mountain"

of a woman cut in a solid rock. So far, it has been impossible to learn when the carving was done or the identity of the sculptor. Markings have been found on the rock which appear to be "1843," the initials "M.A.Y.," and an arrow. It does not seem possible that the work could have been done in 1843, as at that time the region was practically unknown to white men, and the figure is undoubtedly that of a white woman. The work represents a high degree of skill, and must have required unlimited patience as well as the finest tools.

¶Fossil remains of prehistoric animals, weighing altogether 16,000 lb., and including two almost complete skeletons of a dinosaur, have been shipped to the museum of the University of Toronto, Can., as a result of the work of the university scientists along the Red Deer River, Alberta, during the past season.

WALPI, ARIZONA, ONE OF THE OLDEST VILLAGES IN THE UNITED STATES

THE view reproduced here is one of the best ever taken of this spot, which occupies an important place in the early history of the Southwest. It gives an unusually clear idea of its almost inaccessible location. Walpi is one of six Hopi Indian villages in northeastern Arizona, and is situated on the summit of East Mesa. Unlike many similar villages of the region, it is still inhabited by about 200 Indians. The original village, now a ruin, was built in prehistoric times. Because of the attacks of hostile tribes, Apaches, Utes, and Navahos, the village was twice moved higher up the mesa.

PHOTO BY INTERNATIONAL

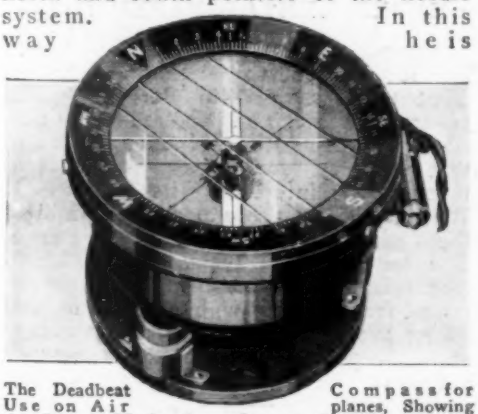
SMOKE SHORTENS LIFE OF METALS

It is well known that smoke is destructive to metals, but to what extent has, until recently, been a matter of speculation. The Mellon Institute in Pittsburgh has just shown by a series of tests that the average life of some metals is as follows:

Metal	Smoky City (Years)	Smokeless City (Years)
Galvanized sheet iron...	3-6	7-14
Galvanized sheet steel...	3-4	5-10
Tin sheet iron.....	13-15	18-28
Tin sheet steel.....	6-10	10
Copper	10-20	No limit

DEADBEAT MAGNETIC COMPASS FOR AERIAL NAVIGATION

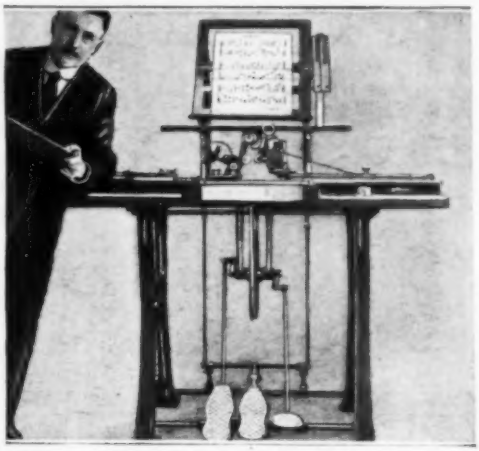
An improved deadbeat, or aperiodic, compass, that is, one which comes to rest by one movement instead of a series of oscillations, after being deflected, has been developed for aerial navigation. It also shows great steadiness under ordinary to-and-fro disturbances. No card is used in its construction. The azimuth degree marks are shown on a movable rim, that carries parallel grid lines running in the north and south direction. The pilot sets his course on the compass by turning the rim until the degree mark of the course comes against the forward lubber's line. While flying he has merely to keep the grid lines parallel with the north and south pointers of the needle system. In this way he is relieved of the necessity of remembering the figure for the course and is also free to move his head, without the risk of misreading the compass by viewing it slantingly.



The Deadbeat Compass for Use on Airplanes, Showing the Degree Marks Appearing on the Rim and the Parallel Grid Lines Which Aid the Pilot in Keeping to His Course

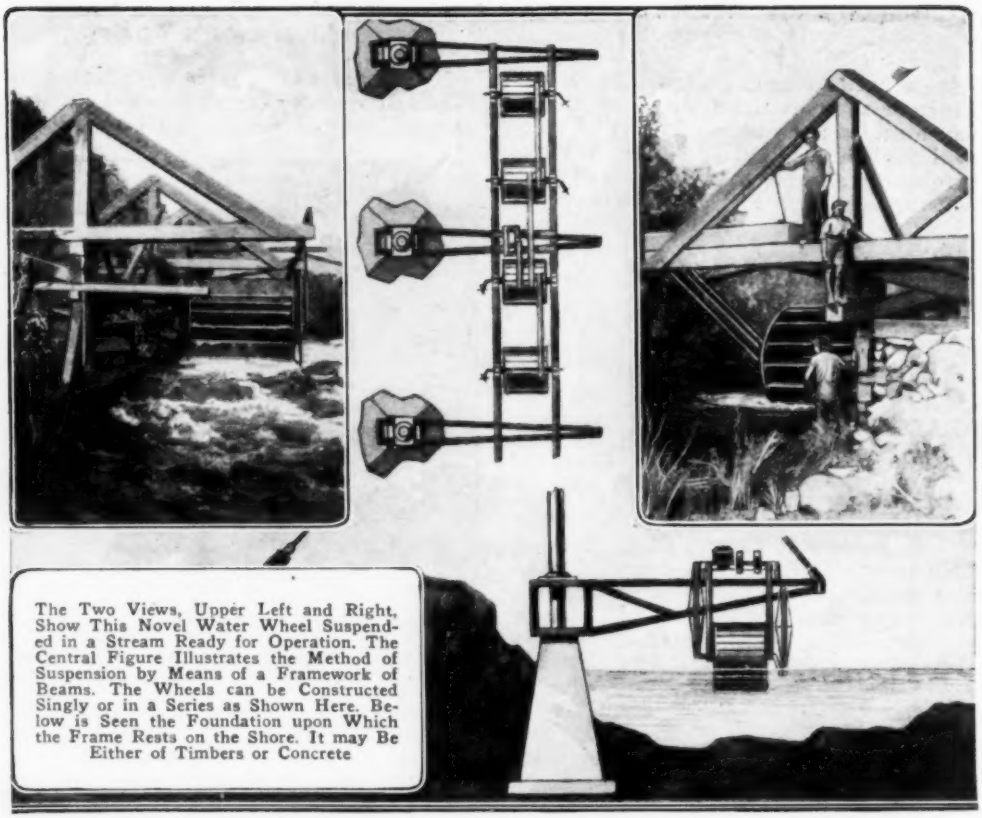
ENGRAVING MACHINE MAKES MUSIC-PRINTING PLATES

Sheet music is now being printed, in Belgium, from plates engraved by a machine as rapidly and as easily as a letter is written on a typewriter, which in some respects the machine resembles. There are two essential parts, one for drawing the staff lines, and the other for the notes. The lines for each staff are drawn in one operation, and the spacing for the entire page is done by the machine automatically. The notes, and all signs in connection with them, are struck mechanically in much the same way as a typebar strikes the letter on a typewriter. The spacing for each line is controlled by the adjustment of a mechanism on one side of the machine, which is connected with a measuring scale that works in combination with a pattern music sheet placed on a stand above the machine. The engraving mechanism requires rotation, which is now obtained by means of treadles, on the order of a sewing machine, but these can be replaced by a small motor, which would make it an entirely automatic machine.



This Machine, Which Engraves Music-Printing Plates, Is in Some Respects like a Typewriter, and is Driven like a Sewing Machine. The Music on the Stand Is a Pattern from Which Adjustments are Made

¶A small electric furnace suitable for machine shops that make their own small steel castings has been developed in Germany. An oil-cooled reactance coil in series with the furnace prevents short-circuiting when the arc is formed. Its capacity is about 1,100 lb., and for such a charge the energy consumption is about 550 kw.-hours.



The Two Views, Upper Left and Right, Show This Novel Water Wheel Suspended in a Stream Ready for Operation. The Central Figure Illustrates the Method of Suspension by Means of a Framework of Beams. The Wheels can be Constructed Singly or in a Series as Shown Here. Below is Seen the Foundation upon Which the Frame Rests on the Shore. It may Be Either of Timbers or Concrete

NOVEL WATER WHEEL SOLVES PROBLEM OF CHEAP POWER

The problem of obtaining power, where the cost of electricity is prohibitive and dams and flumes for water power are not justified, has been solved by the invention of a novel water wheel. This wheel, which can be built to fit any stream, is a simple undershot water wheel with a protective "apron" which keeps it free of driftwood and other débris. The original feature is an arrangement for raising and lowering the wheel. It is suspended over the water by beams anchored on the shore and can be raised or lowered as the water rises or falls. The danger of the wheel being carried away by floods is eliminated by the possibility of lifting it clear of the water. This feature also reduces considerably the strain on the apparatus when not in use, and does away with the need of building the dams and flumes required for ordinary water wheels and reduces the cost of construction about 50 per cent. The materials for construction can easily be transported to locations difficult of access.

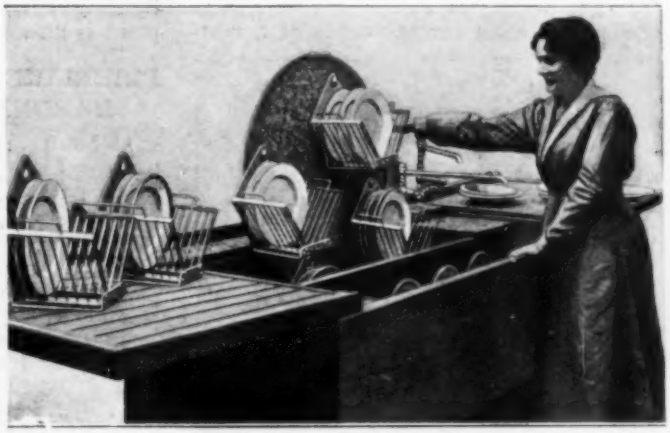
SIAMESE GOVERNMENT BUYS EXPERIMENTAL PAPER MILL

A paper mill, built in the United States, has been shipped to the Siamese government to be erected in Bangkok. The government became interested in the possibility of using the fibrous products of that country for paper manufacture through the interest of its minister, at Washington, in the experimental mill of the United States Bureau of Standards. The bureau made tests, which showed that suitable raw material could be obtained from rice straw, banana stems, and lalang grass, and the government recognized the possibilities offered in the paper industry.

¶By treating wood with sodium carbonate before distillation, an increase of 50 per cent in the yield of wood alcohol is obtained without diminishing the yield of acetic acid, according to experiments conducted by the Forest Products Laboratory of the United States Forest Service, at Madison, Wis.

DISHWASHING MADE EASY BY AUTOMATIC DEVICE

Domestic utilities are rapidly reaching a stage of development that will render the housewife quite independent of the kitchen maid. Dishwashing by hand is already nearly a lost art, and not much loss at that. A new device that is simpler than the average mechanical dishwasher, consists of a water trough that is placed in the sink, and that supports a revolving plate, on which can be suspended three triangular dish-holding racks, in such a manner that they always hang vertically as the plate revolves, and as they pass through the water in the trough. They can be taken from the plate readily and be stood upon the drain board connected with the sink to dry.

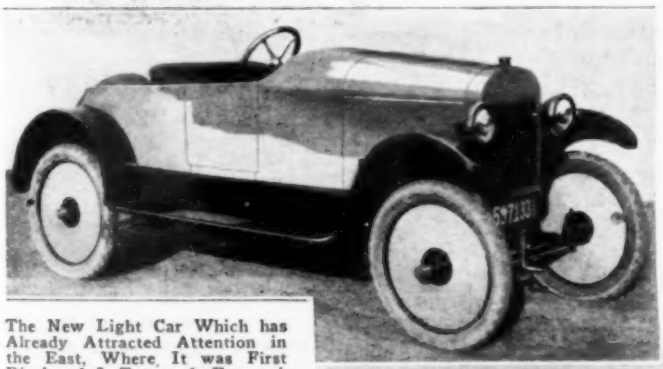


WIDE WORLD PHOTOS

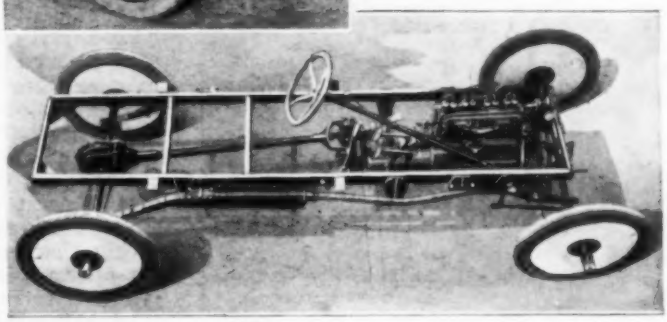
The Housewife is Revolving the Plate on Which are Suspended Three Dish-Carrying Racks That Pass through the Water Trough in the Sink, and are Then Placed upon the Drain Board to Dry

MANY DESIRABLE FEATURES COMBINED IN NEW CAR

It is predicted in automobile circles that there will be a heavy demand for light cars in 1922. One of the new machines, designed to meet this demand, is similar to the light cars manufactured so extensively in Europe. It will be made in a two-passenger body only, with either right or left-hand drive. The wheelbase is 91 in. and the length over all, 122 in. The standard equipment includes disk wheels. Cantilever springs, both front and rear, make it exceptionally easy-riding. The motor is a four-cylinder, four-cycle, air-cooled type with overhead valves, and has developed as high as 22 hp. It is claimed that this car has a speed up to 50 miles an hour on high gear, and that a run of 50 miles can be made on one gallon of gasoline. The weight of the machine complete, except for the top, windshield, spare wheel, and tire, is 900 pounds.



The New Light Car Which has Already Attracted Attention in the East, Where It was First Displayed, Is Extremely Economical in Fuel Consumption, and Is Also High-Powered



The Chassis, Showing the Cantilever-Spring Suspension, Front and Rear, Which is Said to Result in Easy-Riding Qualities: Ruts and Grades are Negotiated without Strain on the Motor and with Minimum Discomfort

OLD BELGIAN HOUSE SERVES AS MODEL FOR OFFICE

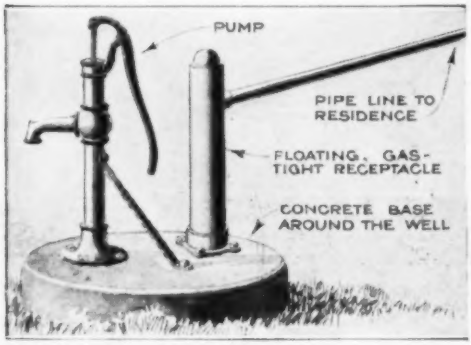
An old house on the Belgium-Holland frontier, destroyed during the war, was used as a model for the office of a real-

This Odd-Looking Real-Estate Office, with Its High Peaked Roof, was Patterned after an Old Belgian House on the Holland Frontier

estate company in Glendale, Calif., which wished to erect a building that would be unique in the town. A draftsman, who had been stationed in Belgium while serving in the army, drew the plans from memory, and assisted the contractor in accomplishing a close copy of the original.

ONE WELL FURNISHES WATER, HEAT, AND LIGHT FOR HOME

On his homestead, near Arvado, Wyo., Edgar Hardesty is able to obtain water, heat, and light all from the same well. When this well was dug, in 1920, it produced not only a good supply of water, but also natural gas. A concrete base



An Ordinary Water Pump is Set into the Concrete Well Covering. A Gas-Tight Receptacle, at the Right, is Also Inserted to Catch the Natural Gas

was built over the well and a gas-tight receptacle inserted in it, to catch the gas, which is piped from the receptacle to the house. There it is used to supply the lighting system and range. A heating plant is now being planned.

PLIERLIKE TOOL FOR TESTING HARDNESS OF MATERIALS

A small plierlike tool for testing by hand the hardness of materials has been devised in Sheffield, headquarters of the cutlery industry in England. Of the two handlebars, the upper one has a looped outer end, and to the bottom jaw of this loop is connected one end of a strong U-shaped spring, whose upper end is free. At the end of the lower handlebar is connected a double-bladed link which extends upward above the upper handlebar, and has pivoted between its blades a lever, one end of which extends over the handlebars approximately parallel with them, and the other is in the form of a cam that, when the lever arm is pressed

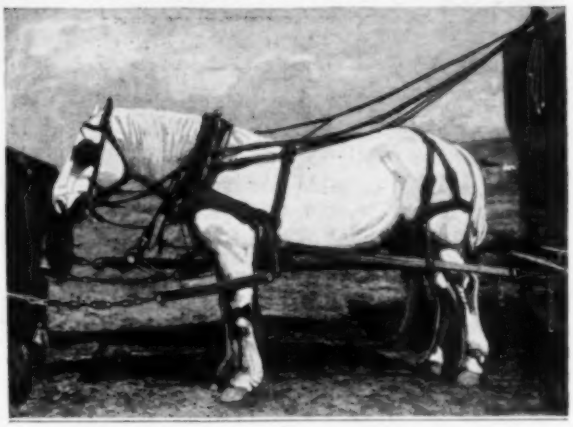
Plierlike Tool for Testing the Hardness of Materials: Any Pressure on the Lever under the Thumb Transmits a Never-Varying Pressure on the Material Tested

downward, exerts a pressure upon the free end of the flat U-shaped spring. This has the same effect upon the gripping jaws of the plierlike device as if the handles were squeezed together by hand pressure alone, but the effect of this spring is that by its means there is always the same known pressure, so that comparisons can be made of the results of this pressure on the materials tested. On the lower jaw is a light auxiliary spring that snaps the pliers open when the pressure is released. In the gripping jaw is a setscrew holding a small hard-steel ball which makes indentations on the material being tested, from which its hardness can be judged.

LOAD DISTRIBUTED EQUALLY ON EACH HORSE OF A TEAM

A new hitch for teams of three, four, or more horses, which compels each horse to do its share of the work, has been devised, and successfully tested, in Canada. In a team of four horses, in place of the ordinary traces of the wheel horses, short leather tugs connect the hames on each side of each horse to an iron buckle that is connected to the backband above, and the bellyband below. Pivoted on this buckle is one end of a hanging steel-lever evener, to the center of which is hooked a leather trace that is connected to the whiffletree. At the bottom of this lever is a hole into which is hooked the traces from the leader horses. In the case of four horses the connections in the lever are spaced equally, but in the case of two wheelers and one leader, the spacing is made so as to put two-thirds of the load on the wheeler horses, thus distributing the load equally.

Hitch That Distributes the Load Equally is Seen on the Harness of the Rear Horses Which are Hitched to the Sulky Plow. It can be Adjusted for a Team of Three Horses



The Wheel Horses of a Team of Four, Showing Steel-Lever Evener, at End of Short Tug from the Hame

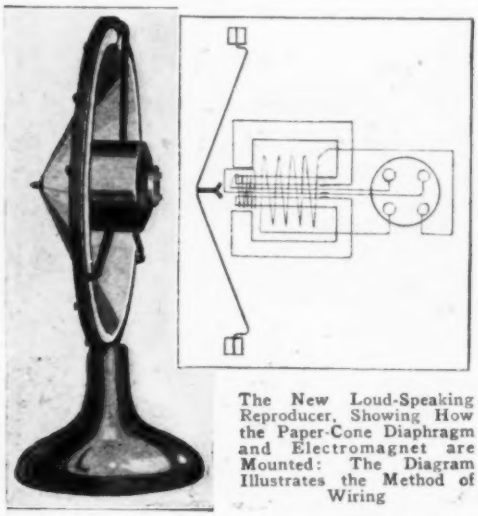
ARRIVAL OF MOTOR CARAVAN IN IDAHO WARMLY GREETED

A caravan of homesteaders recently made an overland motor trip from Brooklyn, N. Y., to Idaho. This caravan, described in November Popular Mechanics, was treated most hospitably along the entire route, and its arrival in Idaho was the signal for demonstrations at every town it passed through. Twin Falls, 15 miles from Buhl, the terminus of the journey, sent out representatives of the Chamber of Commerce to meet and welcome the caravan, and its actual arrival was noisily announced here by the blowing of every whistle in the city.

The Brooklyn, New York, to Buhl, Idaho, Motor Caravan Entering the City of Twin Falls, Idaho

ELECTRICAL SOUND AMPLIFIER USES RIGID PAPER DIAPHRAGM

An instrument for reproducing and amplifying sounds, without the distortion and metallic-sound characteristic of many



The New Loud-Speaking Reproducer, Showing How the Paper-Cone Diaphragm and Electromagnet are Mounted: The Diagram Illustrates the Method of Wiring

reproducers, is suitable for reproducing phonograph music, for addressing large gatherings, for radio work, or any purpose requiring a loud-speaking telephone. This instrument employs a large parchment-paper cone which serves as diaphragm and horn combined. A pair of electromagnets actuate an armature mounted at the apex of the cone, and as the current in the electromagnets varies the cone is vibrated, producing sound waves which are free from the distortion present when metallic diaphragms are used. Such distortions are due to the fact that the latter have a pitch of their own, while the parchment has none.

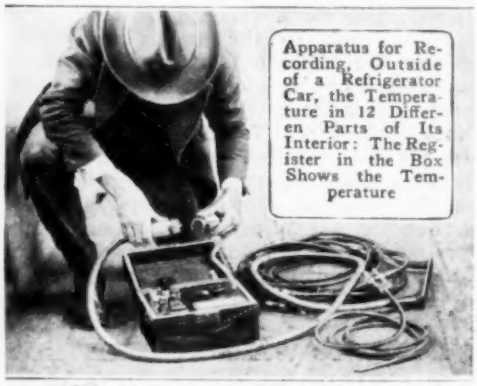
AUTO-REPAIR "INSURANCE" PAYS GARAGE MAN

An enterprising garage owner in an eastern city has inaugurated a new form of service that is of especial interest to automobile owners who drive their own cars. For a payment of $10 monthly he agrees to keep an automobile in first-class running condition. The guarantee covers all expenses classed under the general head of "repairs," including burnt-out bearings, rear-end troubles, transmission troubles, valve grinding, carbon removal, tire blow-outs, starter and electrical troubles, and the like. Oiling and greasing of the car at necessary intervals are included, as well as towing and wrecking service within a radius of 50 miles of the city.

The garage owner accepts no more "risks" than he is able properly to take care of, and reserves the right to reject automobiles just as life-insurance companies are free to refuse policies to applicants whom they consider bad risks. Special rates are made for so-called "flivvers," and there are flat rates on six months or yearly contracts.

DEVICE RECORDS TEMPERATURE INSIDE REFRIGERATOR CARS

It is desirable during the transit of fruit in a refrigerator car to know the precise temperature in different parts of the car, for this temperature is seldom the same throughout the interior of the car. For this purpose the Department of Agriculture has now in use an instrument, operating on the principle of the Wheatstone bridge, that has 12 resistance thermometers for recording the temperature at 12 different parts of the car. A cable is strung along the running board on top of the car, and by means of a copper plate above the door, that permits the latter to be closed and sealed in the usual way, is connected to a cable strung under the roof of the car in such a manner that 12 resistance thermometers hang in different parts of the interior of the car. At some convenient point outside the car the cable is connected to a 12-point plug that fits a socket at the end of a short cable attached to a recording box, in which is



Apparatus for Recording, Outside of a Refrigerator Car, the Temperature in 12 Differen Parts of Its Interior: The Register in the Box Shows the Temperature

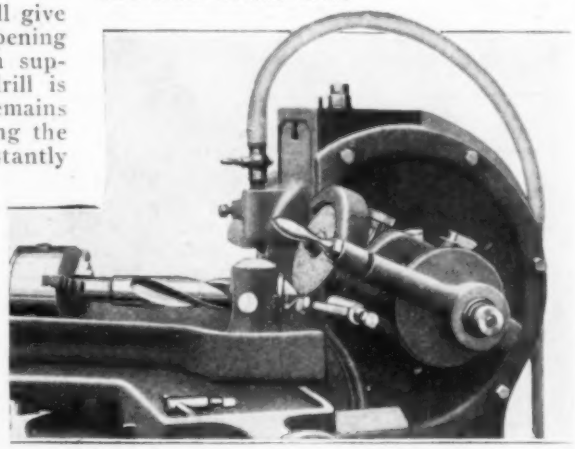
a switch that establishes a circuit with any of the 12 thermometers inside the car. The exact temperature is shown on a register in one corner of the box, and a chart shows the location of each thermometer.

LOS ANGELES HONORS ITS FAITHFUL FIRE HORSES IN DEMONSTRATION

IN recognition of faithful service for the past years, the horses which have hurried the various Los Angeles fire wagons about the streets of that city, have been honorably discharged from service. The ceremony was preceded by a parade in which the faithful animals marched, gaily decorated, through streets of the city which had also been decorated for the occasion. Along the sidewalks of the line of march, thousands of people who had been benefited directly or indirectly, massed to gaze upon the silent veterans of many fires. It was not considered enough merely to muster the animals from service, but they were also provided with a pension in the form of care and good treatment for the rest of their lives. Automobile trucks have displaced the horses in answering the fire calls of that city.

NEW MACHINE FOR SHARPENING AND THINNING TWIST DRILLS

The need of a machine which will give accurate, uniform results in sharpening and thinning twist drills has been supplied by an English firm. The drill is mounted in a chuck, where it remains during the entire operation. During the grinding process the drill is constantly rotated and, by a cam action which repeats itself twice during each revolution, the correct clearance is given to the cutting edge. It is fed forward a predetermined amount at each revolution. For thinning, it is only necessary to move the cross slide to the right, when the drill correctly engages the auxiliary wheel for thinning. During the operation it remains stationary. Behind the chuck which holds the shank of the drill, is fitted a notched plate and latch, giving two positions 180° apart and furnishing an accurate means of obtaining an equal depth of grinding on the two sides of the drill.



The Special Point-Thinning Attachment is Shown Here in Operation. The Arrangement Consists of an Auxiliary Wheel, Mounted on an Arm Swinging around the Main Spindle. The Position of the Wheel is Adjusted by a Screw

COMBINATION SIGNPOST AND MOTORISTS' DIRECTORY

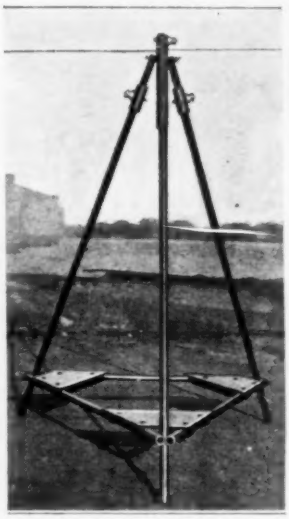
Convenience for motorists is the idea behind a combination signpost and information box. A metal post is surmounted by arrows made of brass and aluminum, which indicate the direction and distance to near-by towns. Below these is a metal box which is opened by pressing on a counterbalanced weight. When pressure on the cover is released, the box snaps closed. Inside are three frames holding cards. One of these cards is a local-road map, another a hotel and garage directory, while the third carries such information as the location of doctors' offices, service stations, and camping grounds in the neighborhood. Celluloid containers protect the cards against dirt and rain.

GAUGE INDICATES OIL SUPPLY AND SIGNALS A SHORTAGE

An oil gauge that can be attached to the oil reservoir of the motor of any automobile furnishes a visible means of telling at all times how much oil there is in the reservoir. If the oil supply sinks to a dangerous level, it automatically grounds the magneto and stops the motor. It has a glass body similar to the ordinary sight-feed oil cup, and in this is a white, plainly visible float, always on the surface of the oil. At the bottom of this oil cup are two electric terminals, one of which is connected to the magneto. The top of these terminals are at the dangerous oil level, and when the float rests on them it short-circuits the motor.

PORTABLE RACK TO SUPPORT TEMPORARY ELECTRIC WIRES

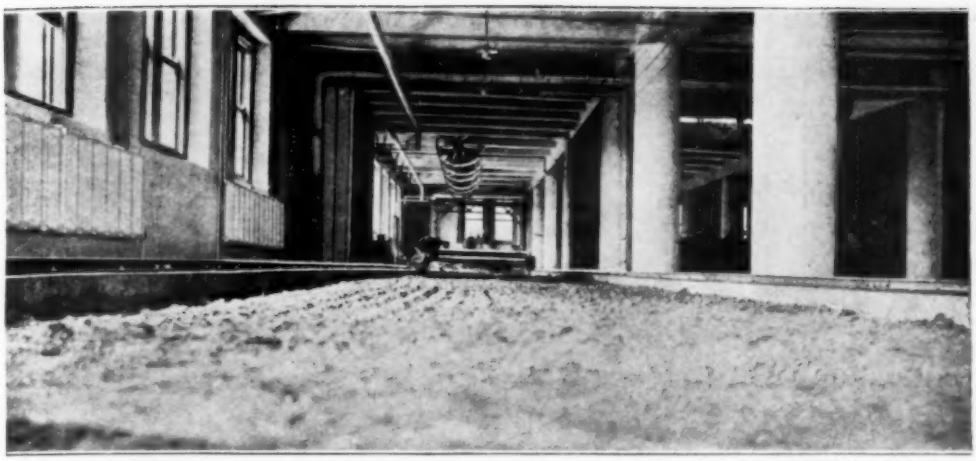
The problem of a suitable support for temporary electric wires, which require frequent moving, is met by a new iron tripod. This is about 6 ft. high and weighs less than 100 lb., so that it can be handled by one man. It is made of iron pipe with a coating of insulating paint. Three uprights are bolted together to form a tripod, and each is equipped with a short insulating sleeve and a porcelain-knob insulator. The legs of the tripod are spaced by a triangle of iron pipe, on each corner of which a ballast plate is fitted that can be weighted to keep the rack from being upset. This rack is suitable for supporting wires transmitting up to 550 volts, and cables up to 2,200 volts.



GROWING LONGER HEMP IMPROVES FIBER

After six years of selective breeding, hempstalks have been developed from less than 6 ft. to more than 14 ft. in height by the Department of Agriculture. The length of uninterrupted fiber between joints was also more than doubled. This produces a better fiber, as some fibers stop or turn off at each joint.

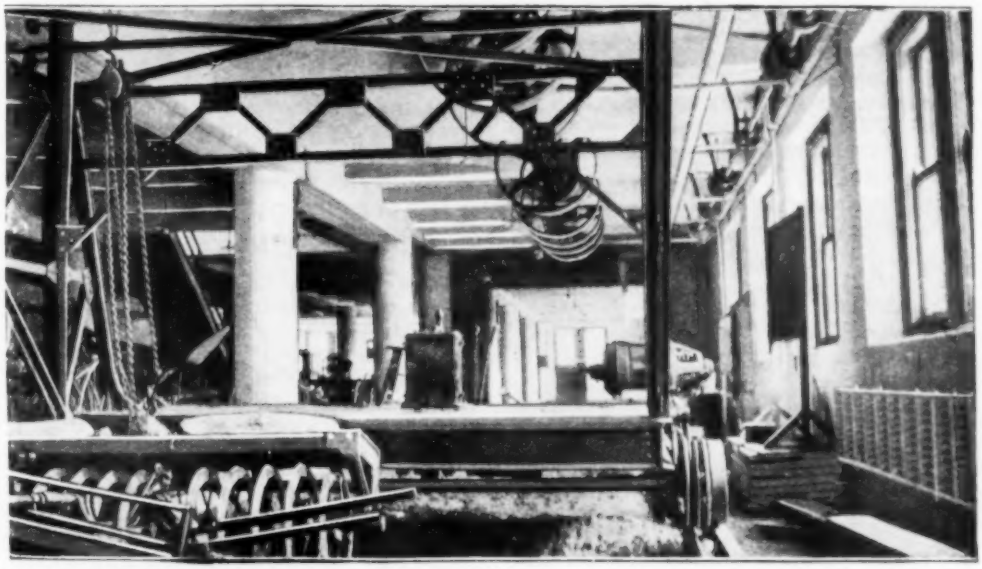
¶Bataan and Pampanga, two Philippine provinces on the northern shore of Manila Bay with a population of about 48,000, are to have electric light and power. Two small rivers, yielding about 400 hp., will be utilized.



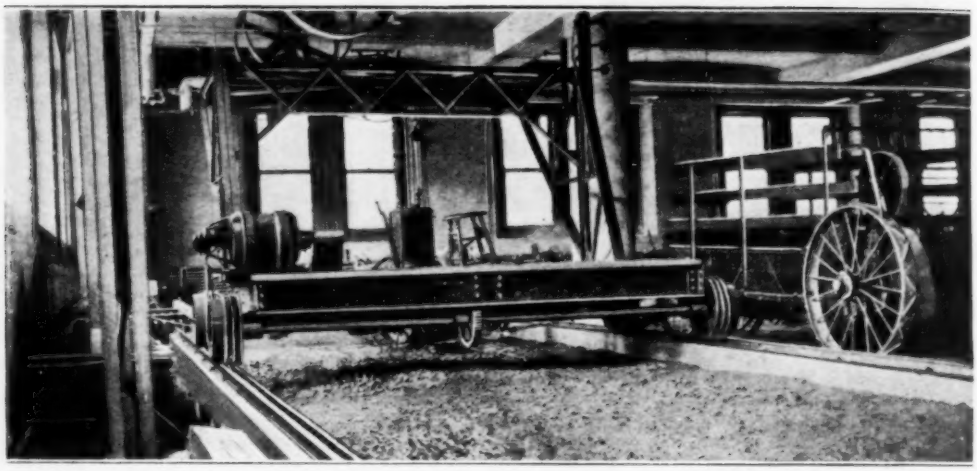
Concrete Rectangular Trough, 165 Feet Long and 12½ Feet Wide, with Four Feet of Soil for Testing the Draft of Farm Implements: Beneath the Soil Is About Two Feet of Crushed Rock on Top of Water, Heating, and Drainage Pipes for Regulating the Soil Conditions

NEW DEVICE TESTS DRAFT OF FARM IMPLEMENTS

TESTS of the draft of farm implements, such as plows, disks, and harrows, have, hitherto, had to be made out of doors. Besides occasional delays caused by inclement weather, there are objections to this method on account of the variability in temperature and humidity, which have to be very carefully taken into account in making comparative tests. Therefore, several members of the faculty of the College of Agriculture of the University of Nebraska have recently made some very interesting experiments that have resulted in a device for testing these implements indoors, where the atmospheric and soil conditions can be controlled in any manner desired. This is done by means of an indoor track, 165 ft. long and 12½ ft. from rail to rail. These rails are laid on top of two 12-in. concrete walls, 6 ft. high, connected at the bottom by a concrete floor, 12 in. thick, and thus forming beneath the whole length of the track a rectangular trough, on the floor of which water, heating, and drainage pipes are laid. These pipes are



Close-Up of the Machine That Hauls the Farm Implements, Such as a Disk Plow, Seen Attached to It, through the Soil: Block and Tackle Connected to the Implement Raises or Lowers It in the Soil. The Machine Runs on the Rails at Either Side, and Gives Dynamometer Tests of the Draft

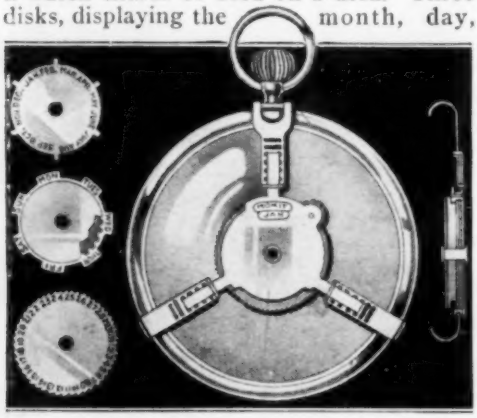


The Machine That Hauls Farm Implements, for Testing Their Draft, over the Soil Contained in the Concrete Trough beneath It: It is Propelled along the Rails by the Electric Motor on One Corner of the Platform, the Speed of Which can be Controlled as Desired

covered to a depth of 1½ to 2 ft. with crushed rock, and on top of this is placed 4 ft. of soil. By means of the water, heating, and draining pipes, the moisture of the soil may be varied from a flooded condition to one in which the soil is dry and dusty. In the experiments made, the implements tested were hauled along the soil by a machine with an 8 by 14-ft. platform mounted on four flanged steel wheels, that ride on the rails, and having a trussed superstructure that extended backward like an inverted "L," so that the implements under test could be raised or lowered in the soil, as well as hauled when the machine was propelled along the track by an electric motor on the platform. The amount of the draft was measured by an ordinary traction dynamometer, but later on it is intended to install an indicating gauge that will furnish a graphical record.

PERPETUAL CALENDAR FITS ONTO BACK OF WATCH

A perpetual calendar, fitting onto the back of a watch, is designed to help people remember the date and day of the week. This novelty can also be worn as a watch charm or used on a desk. Three disks, displaying the month, day, and date are mounted on a spindle behind a main disk, which has an opening to display the correct day of the week and month, and the month of the year. Spur gears are used to turn the disks. It is expected that the setting of the dates will become a daily habit accompanying the daily winding of the watch.



The Main Disk of This Perpetual Calendar is Provided with Adjustable Claws to Clamp It onto the Back of a Watch

NEW TYPE OF WIND TUNNEL FOR TESTING AIRPLANES

In a bulletin issued by the National Advisory Committee for Aeronautics, Max Munk proposes a new type of wind tunnel for testing airplane and airship models. While wind tunnels of the present type have been exceedingly valuable in the development of airplane design, the results of tests on models cannot always be depended upon to apply to full-sized bodies in actual flight. Also, the present tunnels do not offer much possibility of future development of tests. This is chiefly due to the viscosity of the air. The purpose of the present proposal is to change the fluid in order to obtain a

lower ratio of viscosity to density. There is no fluid that can be substituted for air in practical use, but air itself, when compressed, maintains the same degree of viscosity, while its density is increased. Its ratio of viscosity to density is therefore lowered. It is believed that the results which could be obtained by the use of compressed air as a testing medium would fully justify the outlay required to build steel-walled wind tunnels suitable for this purpose.

GREATLY IMPROVED FEATURES IN NEW RESISTANCE BOX

Resistance boxes, for measuring current resistance in laboratories, are now being made in an improved form. Resistance-wire spools are replaced by tube units made by winding a special resistance wire on a porcelain tube. Each unit is covered with a vitreous enamel which holds the wire in place and affords perfect insulation. This makes the entire surface of the unit available for emitting heat energy and increases the watt capacity. The terminal leads consist of round copper braids composed of a large number of flexible wires. The units are connected on the plug board by wingnuts mounted on a threaded stud with the top

This Shows the Various Arrangements of the Tubes in the New Form of Resistance Box

peened over so that the nuts cannot be run off. The thread is a coarse pitch, and a half turn of the nut is sufficient to make or break a connection. These boxes are made in capacities from 10 to 1,000,000 ohms.

MAIL TRUCK ASSISTS CARRIERS IN HANDLING PARCEL POST

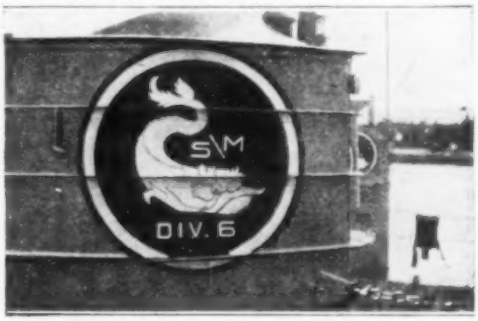
A truck, intended to assist mail carriers in handling parcel-post packages, has been constructed by the superintendent of mails of St. Paul, Minn., and his assistant. The truck consists of a platform and frame mounted on two pneumatic-tired wheels. A hamper, such as is used in handling all mail in the post office, just fits on the platform. The hamper can be loaded at any time and then slipped onto the truck. The loaded truck is easy to push, and saves both the time and

The Parcel-Post Truck Carrying a Hamper Loaded with Packages: Pushing It Is like Play Compared with Carrying a Heavy Mail Bag

strength of the carrier. He can take his entire delivery in one load.

"DOLPHIN RAMPANT" ADOPTED AS SUBMARINE INSIGNE

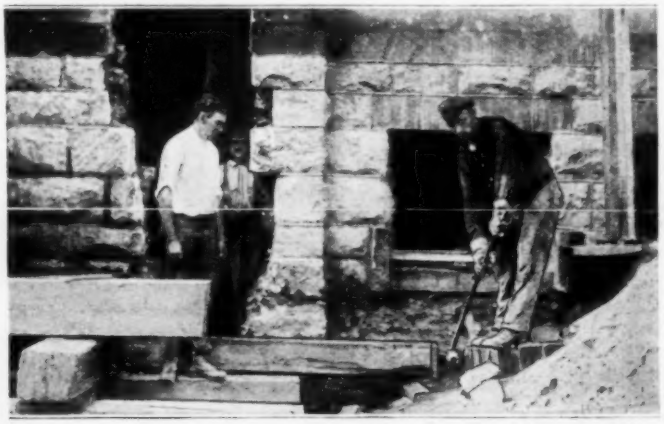
An insigne that is very significant of the kind of work they do, has been adopted by U. S. Submarine Division 6, based at San Pedro, Calif. Inside a circle is the figure of a dolphin with a fierce expression on its face, and with its body curled for action—a figure that in heraldry would be called a "dolphin rampant." The dolphin was selected on account of its enterprising and courageous character. A stencil was made with the design for the insigne cut in it, and from this, uniform prints were made on all the submarines of the division.



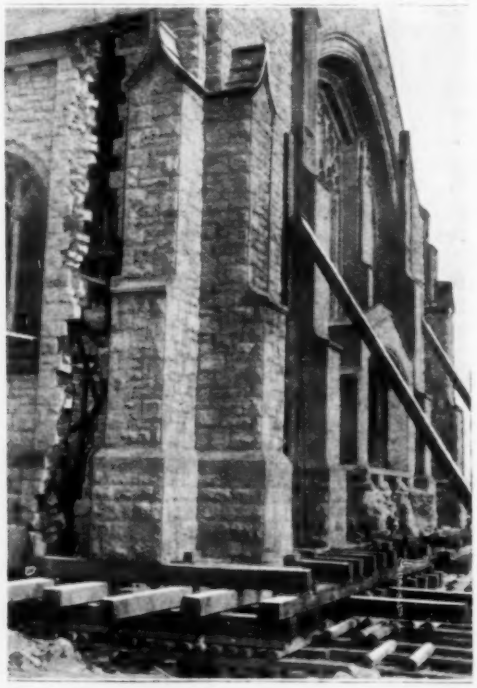
Insigne Adopted by Submarine Division 6, Whose Name is Seen around the Figure That, in Terms of Heraldry, would be Called a "Dolphin Rampant"

STONE-CHURCH FRONT MOVED 30 FEET WITH JACKS

An unusual engineering feat was accomplished in Buffalo, N. Y., when the entire front of a large stone church, the Central Presbyterian, was "sliced" off and moved forward 30 ft., to the sidewalk. The front contains the main-entrance arch, the cornerstone, and two massive pilasters. The slice was 8 ft. thick, 78 ft. wide, and 65 ft. high, and weighed approximately 1,000 tons. Fifteen jack screws, fixed in pump logs, were used for the moving. At a whistle signal these were simultaneously given one quarter turn by the workmen. One turn moved the slice ⅙ in., and the distance covered in 30 minutes was about 25 in. The actual moving was completed in two days. Four huge A-braces, a pair on each side at both ends, prevented the wall from falling. Workmen then filled in the space between the front and the body of the church, and when finished, the building will have several hundred more seats available. The work has been so carefully planned and carried out that, when it is completed there will be no irregularity in the architecture, marks upon the walls, or blemish of any sort to show that a change has been made.



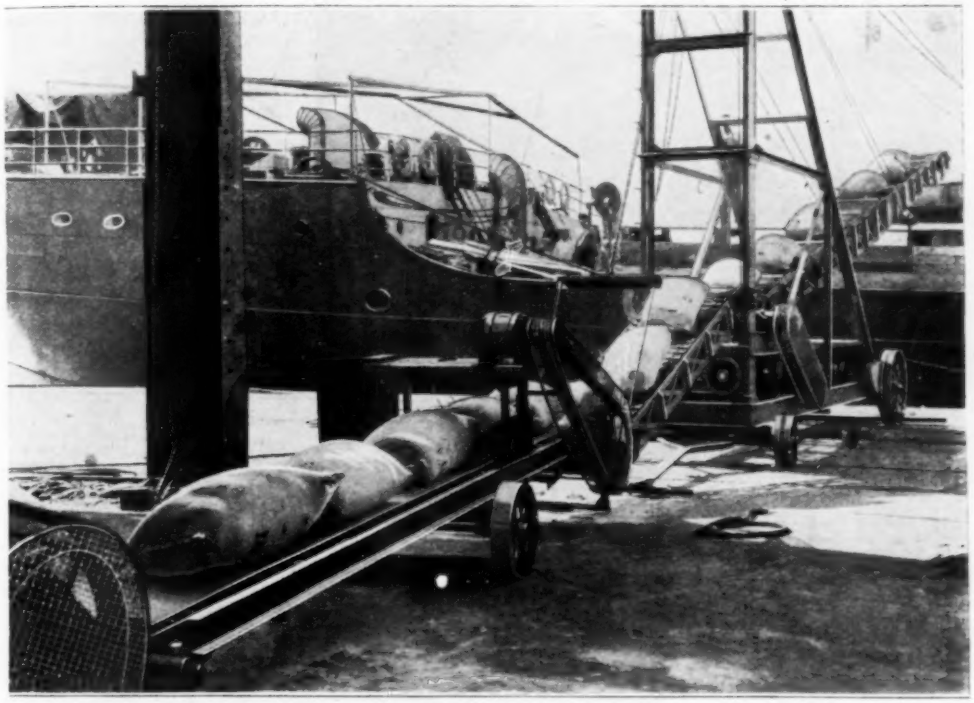
A Workman is Seen Here Operating One of the Jack Screws by Means of Which the "Slice" was Lifted for Moving



The Church Front, Weighing Approximately 1,000 Tons, was Moved Entirely by Hand. The Church is Shown Here After the Cut had been Made and the Jack Screws Put in Place Ready to Move the Slice. One Turn Moved It One-Sixth Inch

RECOVERY OF UNBURNED FUEL FROM FURNACE REFUSE

Considering the present high price of coal, and the prospect of a continuance of these prices, any method of fuel conservation is of great value. For this reason, the Bureau of Mines has been conducting investigations in connection with a method of recovering unburned fuel from boiler-furnace refuse by washing it on concentrating tables. The amount of unburned fuel present in refuse varies greatly in different plants. The tests were made on refuse from a very well-equipped and efficiently operated plant. The results show the possibility of recovering the unburned fuel by crushing the refuse to ⅜-in. ring size, washing on coal-washing tables, and removing the slime from the washed product by a dewatering conveyor-elevator, or a screen. In the tests, the total yield of washed fuel was 20 per cent of the gross weight of refuse treated. In addition to reclaiming the combustible lost in the refuse, this treatment cleans the cinder, and makes it more suitable for use as road material, concrete, or other construction work.



Portable Ship-Loading Conveyor in Use at Norfolk, Virginia, Loading Bag Flour: It is Made in Two Units, the "Piler," or Loading Unit, and the "Trailer," or Conveying Unit. The Use of the Latter Adds to the Flexibility of the Machinery, and Effects a Considerable Reduction in the Cost of Loading

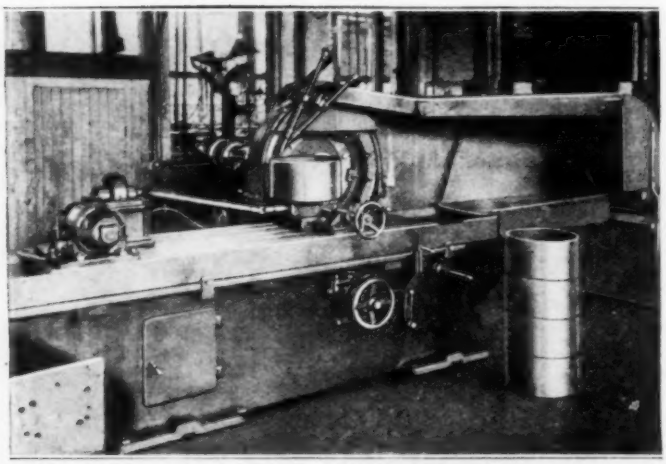
SHIP-LOADING CONVEYOR HAS FLEXIBILITY AND ECONOMY

A ship loader which offers unusual flexibility has been tested at the army base in Norfolk, Va. The results indicate that the cost of loading flour can be reduced from $1.25 to 85 cents a ton, by its use. From 70 to 100 tons of bag flour an hour were handled, and, by speeding up, as high as 200 tons. The machinery consists of units of two types, loading units, or "pilers," and conveying units, or "trailers." The pilers have a steel frame on wheels supporting two conveying booms. The receiving boom can be adjusted to receive from trailers or to be loaded by hand. The delivery boom has a maximum adjustability of 35 ft. to provide for variation in ship levels. The booms are fitted with aprons which consist of two strands of chain connected by steel rods at suitable intervals. An electric motor elevates the booms, drives the conveyor apron, and propels the piler about the dock. Trailer units are provided with an electric motor which serves to drive the apron only. They are light and can be easily wheeled about the dock and put into position by hand.

GLASS HANDLE TO BE ATTACHED TO FRAMELESS WINDOW PANES

A convenient invention, which comes from England, is a handle to be used on frameless car windows, or any other sliding panes of glass for which other handles are not practical. It is made of glass and has a flat surface which is attached to the pane by means of a colorless cement, giving it a neatly finished appearance, while holding it firmly in place.

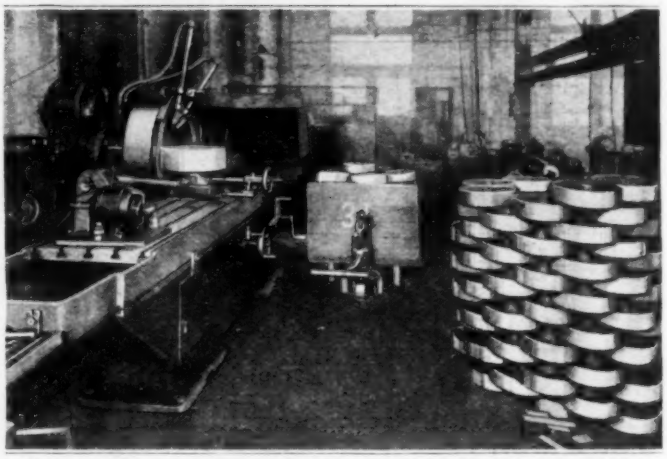
¶A motion-picture film is to be prepared, by European scientists, which will, by the use of diagrams and apparatus, make the principles of the Einstein theory of relativity perfectly intelligible to persons entirely incapable of understanding the complex mathematical formulas involved in any ordinary explanation of this abstract theory.



Attachment on Face-Grinding Machine for Crowning Pulley: The Horizontal Chuck Holds the Pulley against the Inside Edge of the Grinding Wheel. The Chuck is Rotated by Revolving the Fixture at the Left

ATTACHMENT CROWNS PULLEYS ON FACE-GRINDING MACHINE

An attachment mounted on a face-grinding machine crowns pulleys much more rapidly than they can be machined on a lathe. A special revolving fixture is mounted on the table of the grinding machine and connected with the chuck that holds the pulley horizontally against the inside edge of the grinding wheel, and thus rotates the pulley while a crown is being ground on it that will correspond to the inside beveled edge of the revolving grinding wheel. It is said that one of these machines will crown a 12-in. pulley with a 3-in. face in one minute, which would result in a remarkable output in production work. It is also said that the accuracy never varies from the round more than .002 of an inch.



Pulley-Crowning Attachment for Face-Grinding Machine at Left, with a Pile of Pulleys at Right That have been Crowned at the Rate of One a Minute: They Are 12 Inches in Diameter, with Three-Inch Face

Arrangement for Holding Steel Plates in a Storage Yard: The Plates Rest against Concrete Posts, Forming Separate Bins. On Each Post is Inscribed the Size and Description of the Plates

CONVENIENT STEEL-PLATE STORAGE YARD

Neat and practical arrangement of the stock is the outstanding feature of the steel-plate storage yard of one of the Pacific-coast shipbuilding concerns. Concrete posts have been arranged symmetrically in the yard, and against these posts the various kinds of plates are stacked. One of the posts bears a placard, on which is inscribed the size and other descriptive details of the stock placed in that particular compartment. Much time is saved by this arrangement as compared with earlier haphazard methods of storage.

BUTTERFLY-BREEDING RANCH RUN BY MAINE WOMAN

By SAM E. CONNER

A BUTTERFLY ranch is the interesting and lucrative venture of a Maine woman. While the ranch does not pay her so well as the chicken farm, which she also owns, it calls for less work, smaller equipment, and nowhere near so large an investment. A few boxes, some bark, moss, gravel, and earth, form the whole outfit. The ranch grew out of her interest in nature study and her effort to teach her own children and those of her neighbors something about insect life.

Homemade Wire-Screened Hatching Box, in Which Cocoons of Moths and Butterflies are Hatched by the Maine Woman Who is Seated beside It with a Newly Hatched Moth Clinging to Her Finger

In the early days of her venture she depended upon finding the cocoons from which the butterflies and moths are hatched in the woods near her home, but for some time she has been breeding them on the ranch. Hatching boxes are manufactured at home. They are about 2 ft. long by 1 ft. wide and high. The top and sides are of fine-wire screening. The bottom is covered with moss, gravel, or earth, according to the nature of the cocoon to be hatched. A door is fitted in the top so that the cocoons can be readily placed in the box and the moths removed after hatching.

Urania Riphens, from Madagascar, Considered the Most Beautiful Butterfly in the World

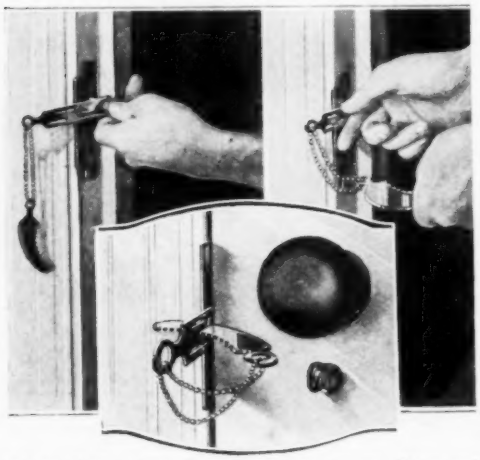
The great difficulty in the breeding of moths from home-produced cocoons is that of keeping the caterpillars where it is possible to get the cocoon once it is formed. The moths lay their eggs on the bark of trees, on leaves, and in other places. Both the Luna and the Cecropia moths deposit their eggs in a strip on the bark of a twig. The former lays eight or ten eggs to the strip, while the latter lays a much greater number. The Polyphemia moth lays but a single egg at a time and upon a leaf. These eggs are closely observed until the caterpillar, which is the embryonic butterfly or moth, hatches. Then the caterpillar is placed on a tree branch until the cocoon has been formed. The method by which the caterpillars are confined to these branches is the big secret of the ranch, which the owner will not divulge. When the cocoon is formed, it is placed in the hatching box to remain until the moth comes forth, when the process is repeated.

Butterfly from India That Simulates a Leaf: In the Branch at the Right One of the Leaves Is a Butterfly

The moths are mounted and sold to collectors, schools, and museums. Besides raising butterflies, this woman also imports them from all parts of the world to mount and sell. Some of the exotic specimens are very rare in this country.

SIMPLE DEVICE MAKES LOCKS BURGLAR-PROOF

Ordinary locks can be easily picked and the best locks can be opened with a master key, but a new device can be used on any lock to make it practically burglar-proof. A slotted metal clip is hooked into the strike plate, and the door is closed. A toothed piece is then inserted in the tightest fitting slot, so that it rests against the door and the doorpost. With this in use, it is practically impossible to open the door from the outside, even with a jimmy.



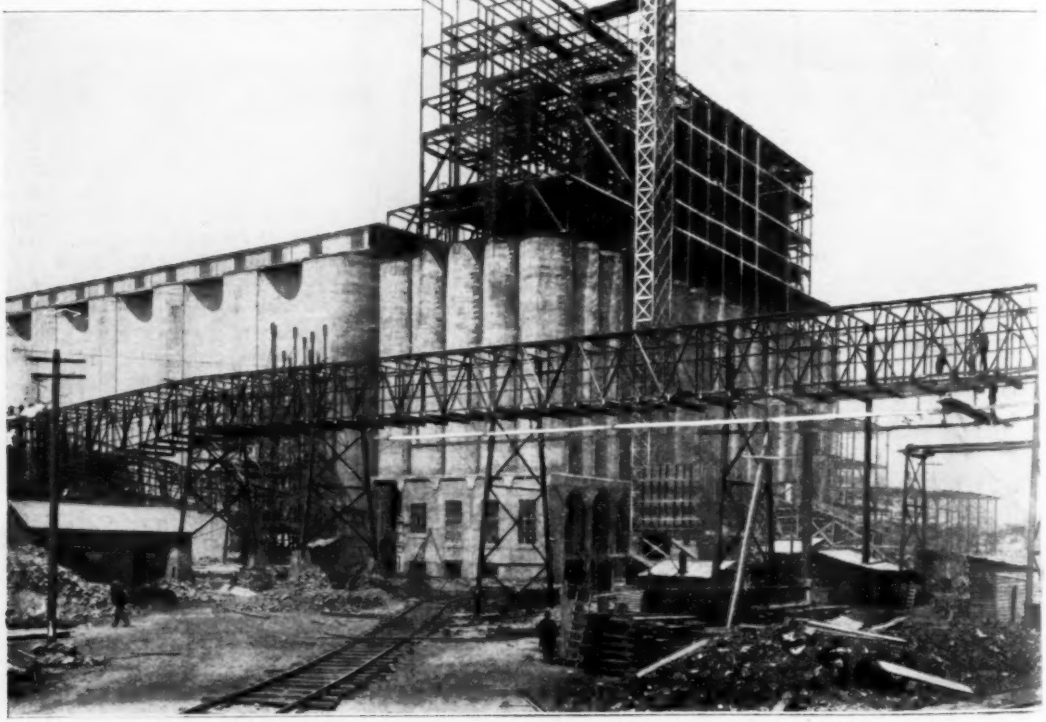
At the Left: The Clip Goes between the Door and Frame. Right: The Toothed Piece is Slipped into the Tightest Notch. Below: The Device in Place

FLASHLESS POWDER DEVELOPED BY ARMY ORDNANCE EXPERTS

The invention of smokeless powder eliminated the possibility of guns being located by an enemy in daylight, and now a flashless powder has been developed by the army Ordnance Corps, which has the same effect in night firing. The purpose is accomplished by introducing substances into the powder which volatilize when ignited, with the effect of diluting and cooling the hot inflammable gases. Tests show merely a momentary red glow in firing five-inch guns.

AUSTRALIAN GRAIN ELEVATORS OF AMERICAN DESIGN

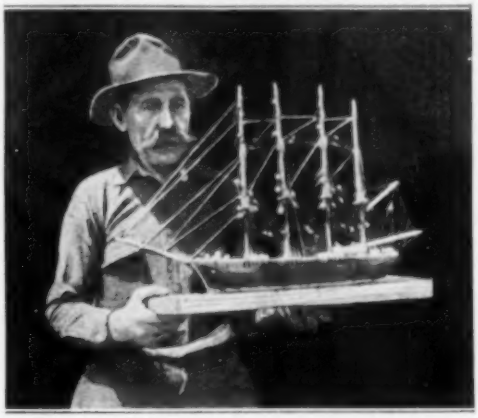
Australia suffered greatly during the war through the lack of modern methods of handling grain. The losses entailed by the use of the old methods convinced the government of New



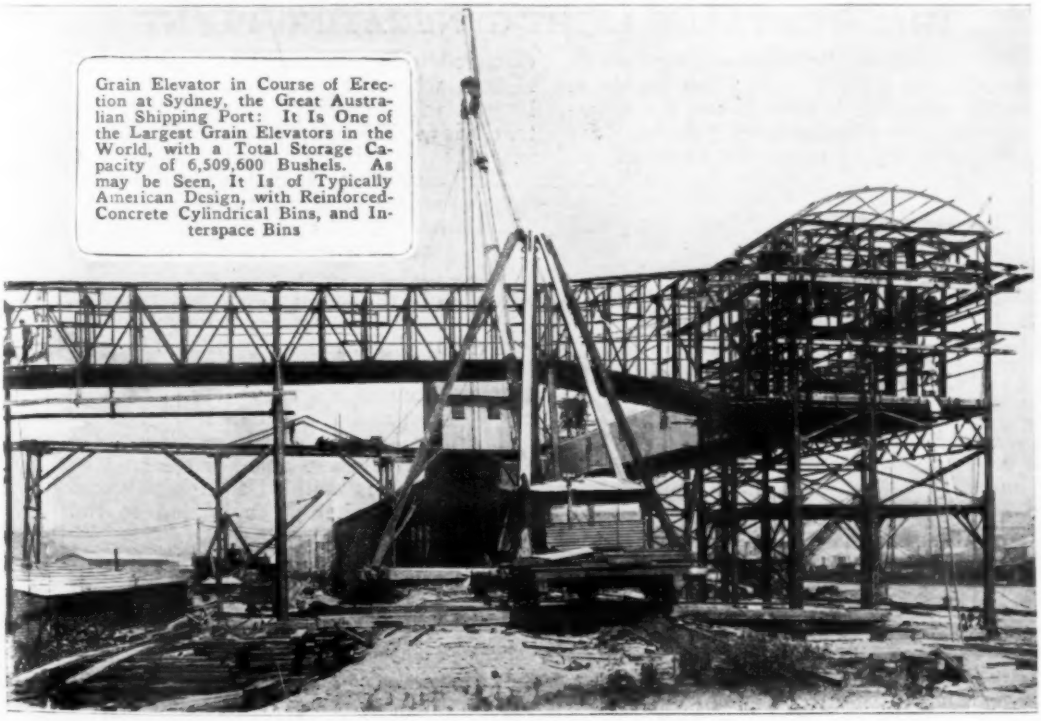
South Wales that a change was necessary, and a progressive program of modern grain-elevator construction is now being carried out in the wheat-producing centers of the country, and at the shipping port of Sydney, where much the largest of these elevators is located. This terminal elevator is one of the largest grain elevators in the world, having a total storage capacity of 6,509,600 bu. It is a typically American reinforced-concrete elevator, and has 72 circular main bins, and 71 interspace bins. Attached to these is a working house with another 139 storage bins. There are 20 receiving hoppers on four railway tracks, where the grain is unloaded from the cars at the rate of 60,000 bu. an hour. There are the usual hopper scales, drying plant, and conveying machinery. Everything is electrically operated. The railway cars are unloaded by power shovels, and car pullers haul them into position.

MODEL OF FULL-RIGGED SHIP WEIGHS ONLY HALF A POUND

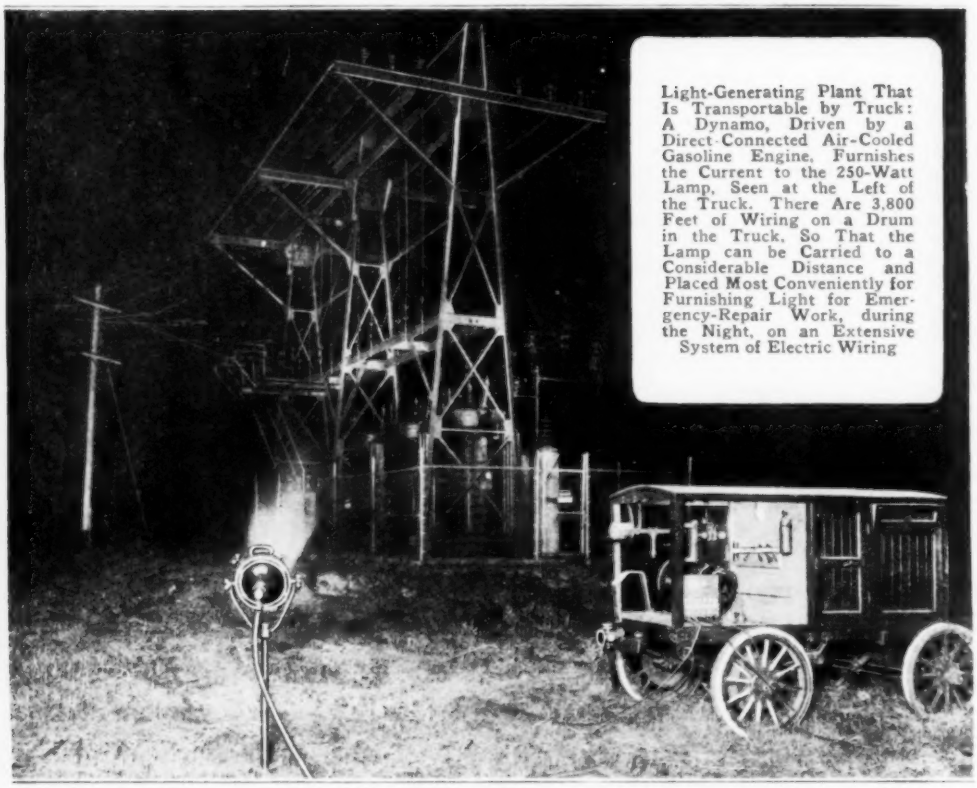
A model of a full-rigged, four-masted ship has been made of balsa, a wood lighter than cork, by George Larsen, of San Francisco, Calif., one of the oldest marine divers on the Pacific coast. The model, measuring 15 in. over all, is nearly 14 in. high, and has a beam of 2¾ in., mounted on a base 20 by 5 by 1 in. thick, and yet the whole thing weighs only ½ lb. The masts had to be made disproportionately thick on account of the flexible nature of the wood. Besides the masts, there is a jibboom, yards, and spanker rigging. The model is very complete, including even a small lifeboat only 2 in. long.



Model of Full-Rigged Ship Which, Together with Its Stand, Weighs Only Half a Pound: It is Made Throughout of Balsa, a Wood Lighter Than Cork



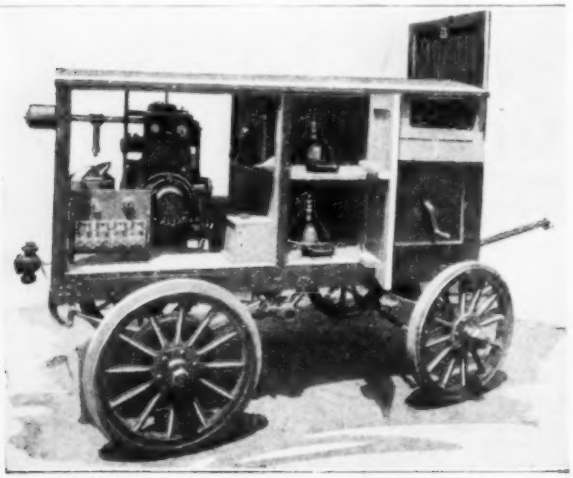
Grain Elevator in Course of Erection at Sydney, the Great Australian Shipping Port: It Is One of the Largest Grain Elevators in the World, with a Total Storage Capacity of 6,509,600 Bushels. As may be Seen, It Is of Typically American Design, with Reinforced-Concrete Cylindrical Bins, and Interspace Bins



Light-Generating Plant That Is Transportable by Truck: A Dynamo, Driven by a Direct-Connected Air-Cooled Gasoline Engine, Furnishes the Current to the 250-Watt Lamp, Seen at the Left of the Truck. There Are 3,800 Feet of Wiring on a Drum in the Truck, So That the Lamp can be Carried to a Considerable Distance and Placed Most Conveniently for Furnishing Light for Emergency-Repair Work, during the Night, on an Extensive System of Electric Wiring

TRANSPORTABLE LIGHT-GENERATING PLANT

A miniature light-generating plant, mounted on a light truck, that makes it readily portable, is now in use for emergency-repair requirements, during the night, at outlying points on an extensive electric-wiring system. The light is furnished wherever required by 250-watt lamps, with 15-in. reflectors. On the truck is a 120-volt dynamo, direct-connected to an air-cooled gasoline engine, and there is a tank that holds ample gasoline to maintain the current all night if necessary. In the front part of the truck is a reel, operated by a crank handle, on which is wound 3,800 ft. of insulated wiring, to which the lamps are connected, allowing them to be carried some distance from the truck. Between this reel and the dynamo are lockers for keeping the lamps when not at work, and also for tools. This outfit is coupled to a high-speed truck when it is hauled to the scene of emergency.

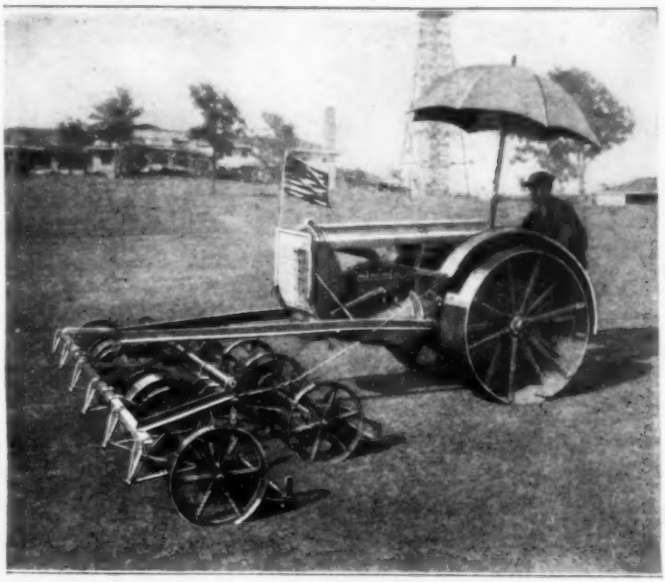


Truck with Electric-Light Generating Plant: At the Rear Is a Dynamo and Gasoline Engine; above the Front Wheels Is the Reel of Wire for the Lamps. Lockers Hold Tools and Lamps

¶Tests by the Department of Agriculture show that yeast feed for laying hens temporarily increases egg production, but eventually decreases it and results in high mortality.

TRACTOR-POWERED MOWER HAS FRONT GANG CUTTER

A tractor-propelled mower for golf courses, parks, and the lawns of large estates has the feature of a multiple-unit mower replacing the front wheels of the tractor. This unit consists of five mowers arranged in two rows, the rear row having two and the front row three mowers. The cutters are attached to the tractor by means of an angle-iron frame centering on a pivoted bearing which allows the machine to be guided by means of steel cables. The outfit cuts a path 12 ft. wide. It can be attached to any tractor. Each mower is independently hinged from a front crossbar to allow it to aline itself with the ground.



This Power Lawn Mower Has Five Mowers Replacing the Front Wheels of the Tractor. The Mowers are Attached to the Tractor by Means of an Angle-Iron Frame, and Steer from a Central Bearing

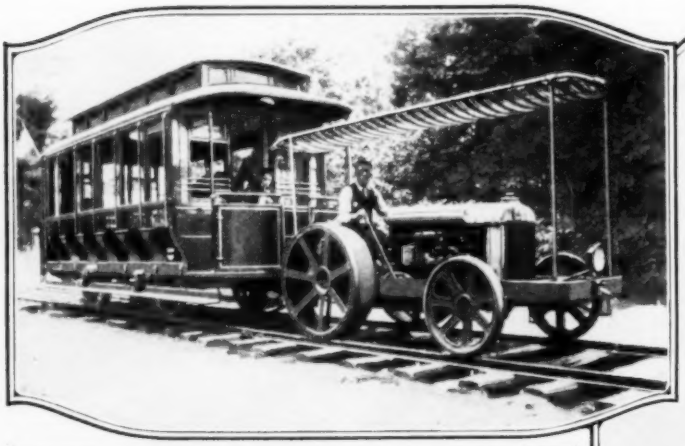
MELTING SNOW RESEMBLES VOLCANIC ERUPTION

Melting snow, at Crater Rock, near the summit of Mount Hood in Oregon, recently caused a disturbance which was at first mistaken for a volcanic eruption. Parts of the rock are always hot and the high temperature melts large quantities of the snow which lies on the mountain at all seasons of the year. The water flows down beneath the snow and ice fields below. When its progress became blocked, it forced its way through a 15-ft. thickness of ice, causing a tremendous rumbling. When the stream reached the surface it was still hot, and carried steaming mud and sand, together with great blocks of ice, down the mountainside. The flow continued for several days.

Mud and Sand Flowing down the Mountain Formed Ridges Not Unlike Lava Deposits. The Rumbling Resembled the Sound of a Volcanic Eruption

This Huge Block of Ice was Tossed Out Bodily by the Force of the Water When It Broke through from Its Confinement beneath the Ice Bed

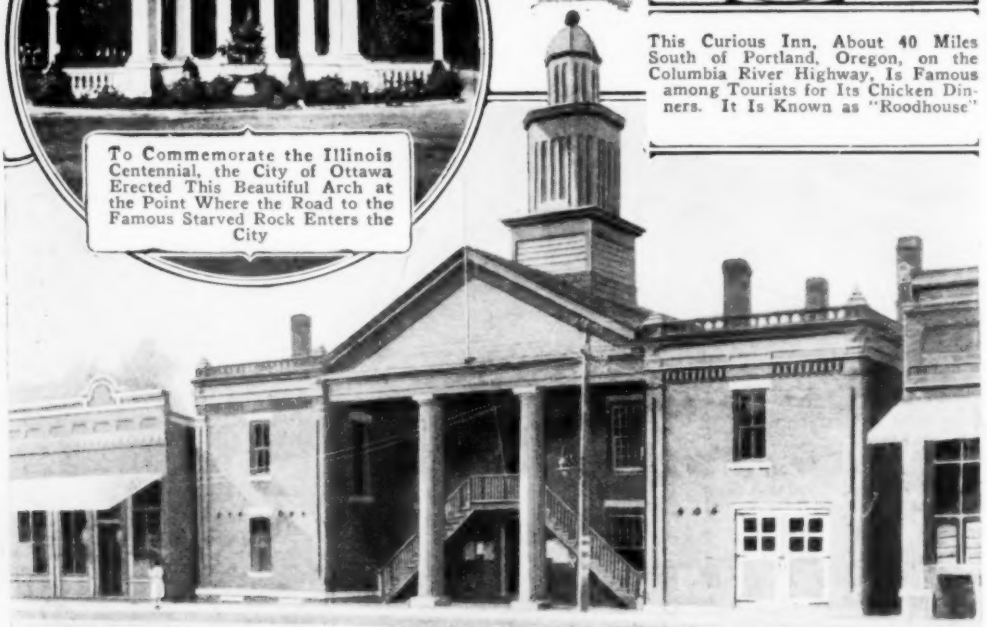
CIVIC FEATURES THAT PROMOTE THE COMFORT



When the Cost of Power Threatened to Bankrupt the One-Mile Railway between Chesapeake Beach and North Beach, Maryland, the Operator and President Decided to Use a Farm Tractor with Flanged Front and Rear Wheels Grooved to Fit the Track

This Curious Inn, About 40 Miles South of Portland, Oregon, on the Columbia River Highway, Is Famous among Tourists for Its Chicken Dinners. It Is Known as "Roodhouse"

To Commemorate the Illinois Centennial, the City of Ottawa Erected This Beautiful Arch at the Point Where the Road to the Famous Starved Rock Enters the City



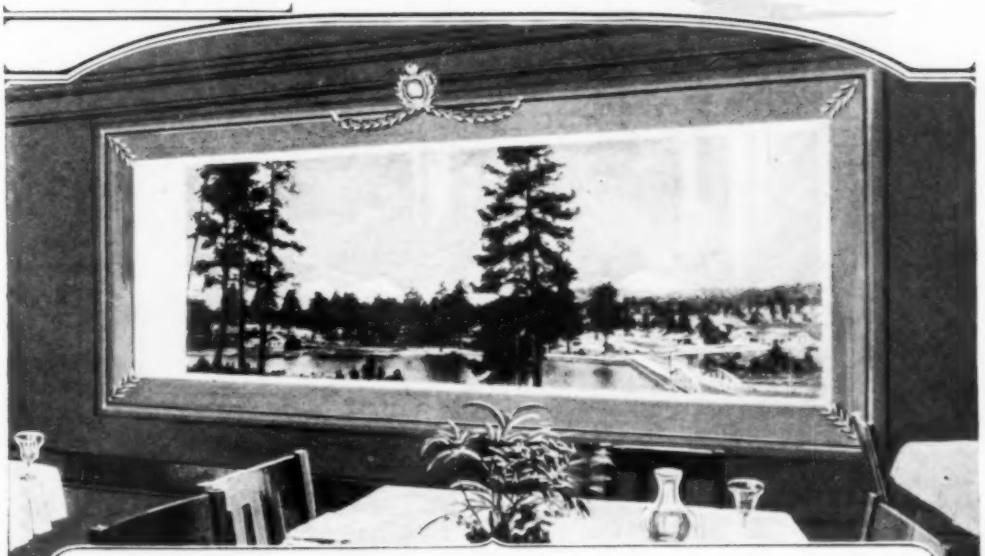
Illinois' Oldest Courthouse, at Metamora in Woodford County, was Built in 1844. It has been Presented to the State to Serve as a Museum for Relics of Abraham Lincoln and Other Historical Characters

AND ENJOYMENT OF VISITORS AND RESIDENTS

The People of Kansas City, Missouri, have Erected a Monument in Honor of the Heroes of the City Police Force Who have Lost Their Lives in the Line of Duty

During a Convention in St. Joseph, Missouri, Local Men Mounted a Book, with 3 by 6-Feet Pages, Describing the City, on a Truck. Members of the Delegation Turned the Pages for Visitors to Read

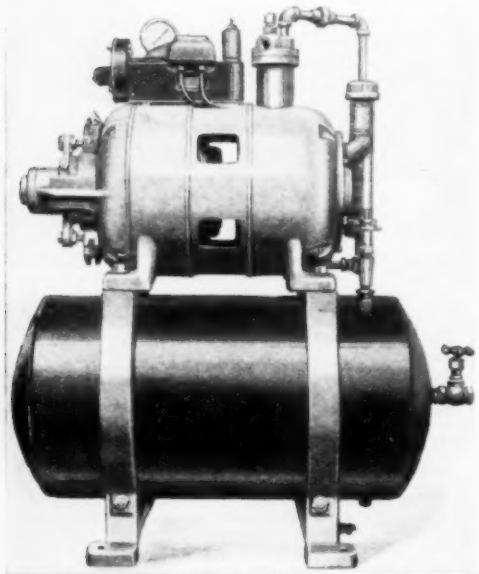
A Trophy, Representing the California Bear Standing on a Redwood Stump, has been Presented to the Marine Corps, for Rifle Competition, by San Diego Civic Organizations



This Window, in a Western Hotel, was Framed like an Oil Painting, in Justice to the Beautiful Lake and Mountain Panorama It Reveals. Many Visitors are Attracted to Look through the Picture Window

AIR-COMPRESSING OUTFIT THAT IS VERY COMPACT

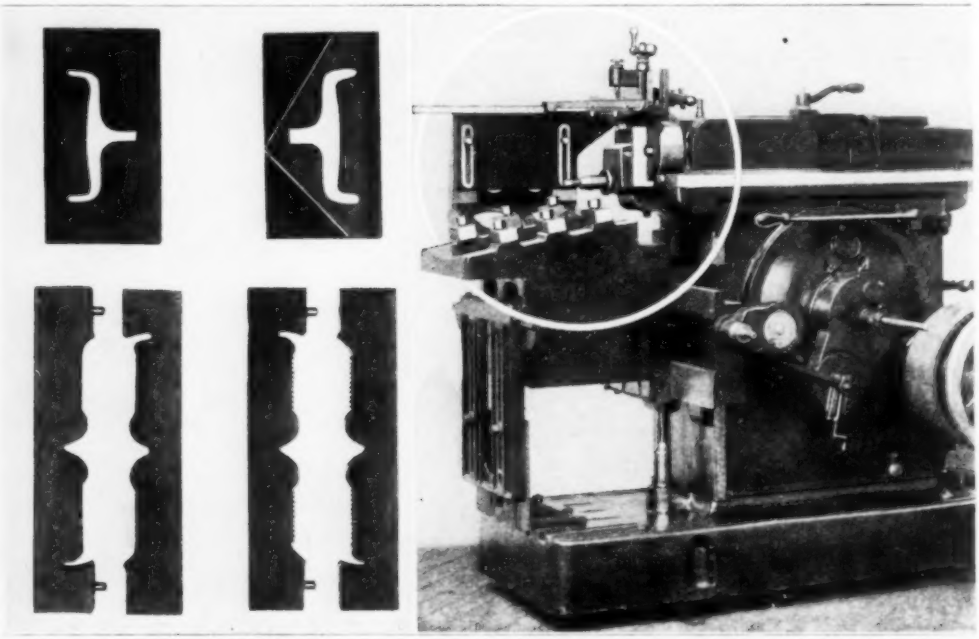
Small, compactly built air-compressing outfits, in which the compressor, motor, and air-receiving tank are combined as a unit, are now a quite common product. An interesting example of one has a low-speed electric motor, direct-connected to the air compressor, all in one housing, which has supporting feet bolted to ring frames around the receiving tank. It is a high-pressure outfit, and has an automatic cut-out set for 200 pounds.



Compact Air-Compressing Outfit That Has Motor Direct-Connected to Compressor in One Housing, Bolted to Receiving Tank Below

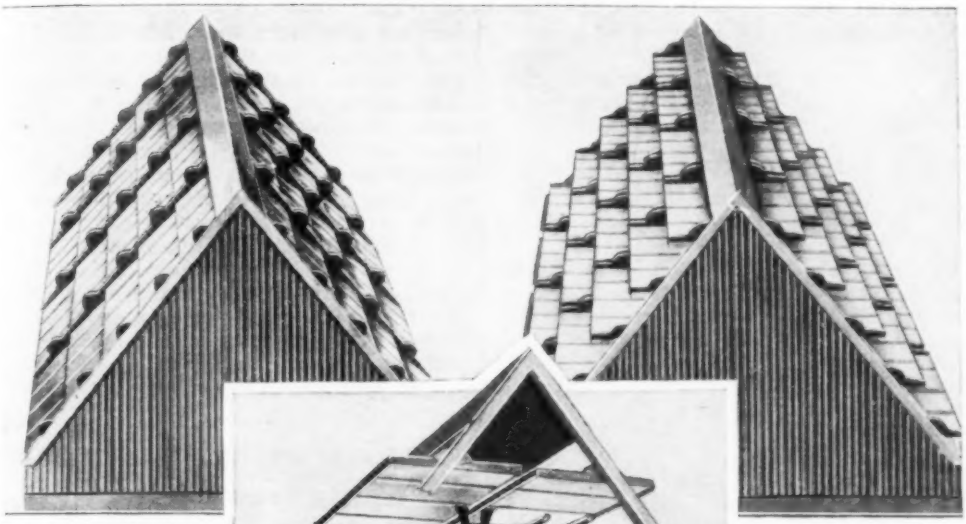
SHAPER ATTACHMENT PRODUCES IRREGULAR-CURVED SURFACES

An attachment that can be fitted to a standard shaper head will machine irregular curved surfaces. It is particularly adapted for handling die work, bending forms, and formed tools of any extreme-angular or curved shape. The work of the cutting tool is regulated by a template which is carried in a cross-slide holder, and is made from about ½ by ¼-in. stock, shaped to the required outline of the surface to be machined. The cutting tool is directly beneath the follower and is raised and lowered as the follower moves along on the surface of the template, and reproduces its curves and angles. Besides machining die work and tools to particular advantage, the attachment is useful for any kind of work that is difficult to machine and in quantity production.



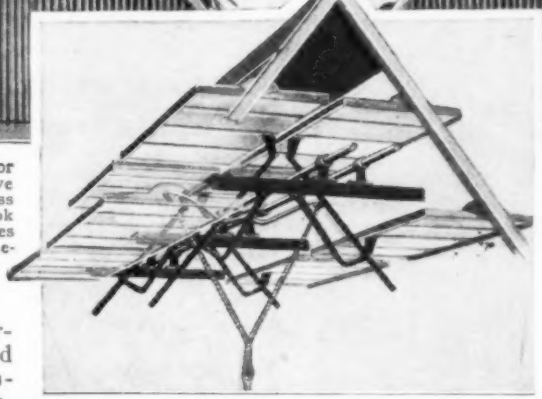
Within the White Circle Is the Attachment on a Shaper Head That Machines Dies, Formed Tools, and Other Work of Any Irregular Shape. At the Top of the Attachment Is the Follower That Moves along a Template and Causes the Cutting Tool Below to Reproduce Its Shape. At the Left Are Samples of Its Work

SKYLIGHT VENTILATOR OPENED BY GRAVITY



The Skylight Ventilator Shown Closed: The Five Rows of Frosted-Glass Members That Look and Act like Shingles All Close Simultaneously and Are Absolutely Storm-Proof

The Skylight Ventilator Open, Showing How the Total Area of All Openings Equals the Area of the Well Opening, Affording Maximum Ventilation. The Entire Top of Skylight Opens

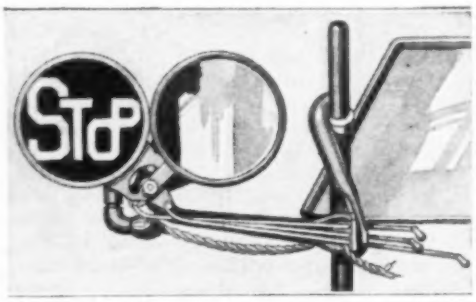


View of Parts of Skylight Ventilator, Showing the Single Rope by Which It is Operated, and the System of Levers in Connection with It: The Ample Size of the Opening is Clearly Indicated

A gravity-operated skylight and ventilator of interesting construction has been recently put on the market. The unit consists of a wedge-shaped framework, which holds five tiers of frosted-glass ventilating windows on each of its inclined faces. Attached to its top, on the inside, is the operating mechanism which is composed of a series of operating levers linked to bars that connect the tiers of windows and open or shut them all simultaneously. The windows are counterweighted to drop open when the mechanism is not locked by a rope or cable leading to the floor below. Thus, in case of fire, the rope would burn, or a fusible element in it give way to the heat, causing the windows to drop open. Whether open or closed, the device is claimed to be entirely storm and rain-proof, and the pitch of its sides prevents any accumulation of snow.

NEW AUTO SIGNAL IS ALSO PARKING LIGHT AND MIRROR

A compact automobile signaling device, which is also a rear-view mirror, a parking light, and a handy connecting point for an extension light cable, is so made that it clamps firmly to the side member of the windshield frame. The three signaling disks, one marked with the word "stop" and two with direction-indicating arrows, are normally concealed behind the rear-view mirror. When it is desired to signal a following driver, the proper one of three small levers, connected with

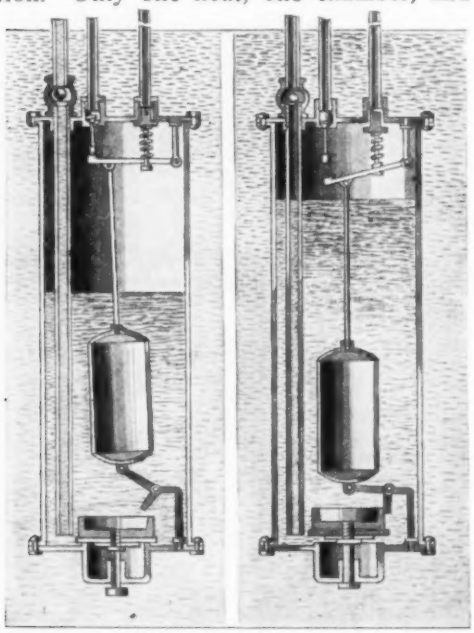


This Automobile Signaling Device Is a Rear-View Mirror with Three Signaling Disks behind It, Any of Which may be Exposed in the Way the Stop Signal is Shown

the disks and projecting a short distance inside the car, is moved to the right. This throws the semitransparent disk from behind the mirror and in front of a small electric light which displays the signal distinctly even at night. The latter also serves as a parking light when the car is left standing.

AIR-POWER PUMP USES ONLY ONE FLOAT

A decided simplification of the rather complicated structure of the pneumatic farm pump is effected by a recent invention. Only one float, one chamber, and



Right: Float is Held by Catch While Tank Fills; Exhaust Valve Is Open. Left: Tank is Emptying; Air Valve is Closing; Exhaust Is Not Yet Open

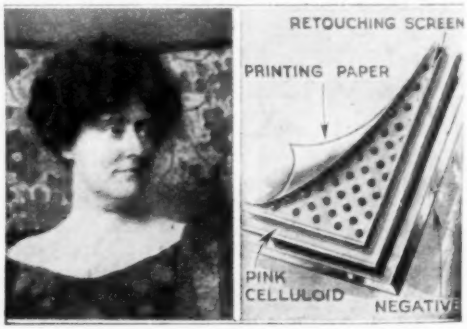
four valves—inlet, outlet, air, and exhaust—are used. The action is positive. There can be no air leakage or loss of energy due to unused compressed air, as a locking device on the float holds the float in position at the bottom of the tank, and so prevents the opening of the air valve until the tank is completely filled with water. With the tank full, the intake valve drops, releasing the float. In rising, the float first closes the exhaust and then opens the air valve. In dropping, the float first closes the air and then opens the exhaust. This arrangement prevents the loss of air, as only one valve—air or exhaust—is open at any one time.

SEVEN-TON GASOLINE TANK FLOATED INTO GARAGE PIT

When a garageman in Elkins, W. Va., received a seven-ton gasoline tank he was puzzled by the problem of lowering it into the pit which had been dug to receive it, but he finally hit upon the novel idea of floating it into place. The cylindrical tank, with a capacity of 12,000 gal., measured 9 ft. 8 in. in diameter and 23 ft. in length. An excavation 12 by 12 by 24 ft. had been made to receive it, but there was no way of lowering it into place. The hole was finally filled with water and the tank rolled into it. It floated easily and when the water was pumped out, it settled gently into the proper position.

PHOTOGRAPHER'S RETOUCHING SCREEN SAVES MUCH LABOR

Hand retouching of photographic plates may soon be numbered among the forgotten arts, an expert retoucher having invented a screen which, it is claimed, gives the desired fine stippling effects and shadings in the prints. The device, based on well understood optical laws, consists of a sensitive film covered with black dots, over 7,000 of them to the square inch. They are equally spaced and roughly resemble the diamond spots on playing cards. Though their centers are quite opaque, they increase in transparency toward their edges, in equal gradations, until they finally fade out into the surrounding spaces. To use, the screen is placed between the negative and the printing paper with the film side down. When very soft, diffused effects are desired, a second screen of slightly pink celluloid is placed between the negative and the screen.



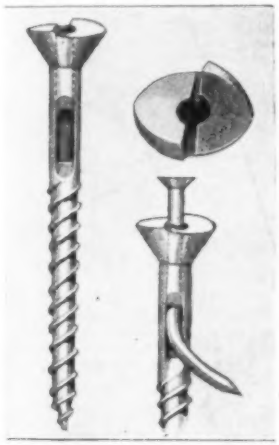
At the Left: A Photograph Showing the Effect of the Retouching Film. At the Right: The Negative, Film, and Paper Arranged for Printing

BOSTON WILL CUT NEW STREET THROUGH HEART OF CITY

In order to allow business expansion in what is believed to be the logical direction, an entirely new street is to be opened through the heart of the city of Boston. It will extend from the theater district and the edge of the downtown business district at Eliot and Tremont streets, to a point on Huntington Avenue midway between the Public Library at Copley Square and the Mechanics Building, in the Back Bay district. In opening the street, more than 100 buildings, including a theater and two apartment houses, will have to be torn down. For a part of the distance the old right of way of the Boston & Providence Railroad will be used as the right of way for the street.

WOOD SCREW CANNOT BE TURNED OR PULLED OUT

To prevent the pilfering of wooden packing boxes by thieves, a new screw which cannot be turned or pulled out, has been invented. Left-hand turning of the screw is impossible, as the head has been milled away at the two points against which a screwdriver would have to bear to permit such an operation. Furthermore, the screw is bored so that a nail can be driven through it, the point of the nail being deflected as it reaches the bottom of the bore through a slot in the side of the screw and enters the wood at an angle.



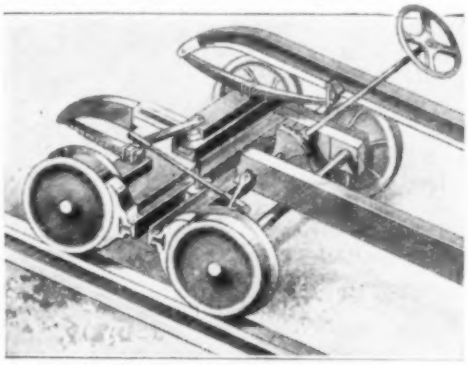
COMPASSLIKE DEVICE MARKS PATTERNS ON THE GROUND

A peculiar tool designed by a French inventor is intended to be used in laying out ornamental borders around gardens. It resembles a large compass and is made of light metal or wood. One point is sharpened for inserting in the ground. The other end is fitted with a roller on which a fancy design is cut. It is similar to markers used in tracing embroidery patterns on linen. When used on soft earth or sand, the pattern on the roller is traced in the soil.

The Tool for Marking Patterns on the Ground in Use: The Circle can be Made Any Desired Size by Merely Adjusting the Arms of the Tool

STEERING WHEEL APPLIES BRAKES ON MOTOR TRUCK

The steering wheel of motor trucks supplied with flanged wheels to operate on railroad tracks is not needed, so one railroad has utilized it to operate a powerful brake. A small four-wheeled truck replaces the front wheels of the motor truck. These wheels have regulation brake shoes, on the front of the rear pair and the rear of the front pair, connected by transverse brake beams. A cam, operated by the steering wheel, moves the brake beams apart and applies the brake shoes to the wheels. Gear reduction multiplies the power exerted. For very quick stops the regular truck brakes, acting on the rear wheels, are also applied.



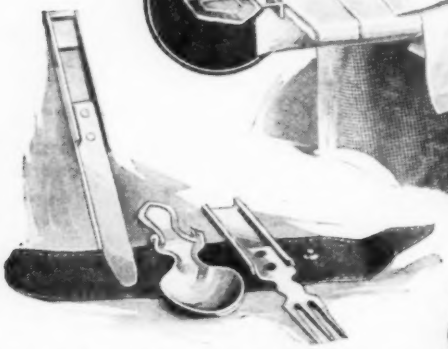
For Railroad Use, Four-Wheeled Trucks Replace the Front Wheels of Motor Trucks, and Brakes are Applied by Means of the Steering Gear

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

The Pan Scraper Shown Above is Made in Three Shapes, Square, Oval, and Triangular. It Is of Nickelplated Metal

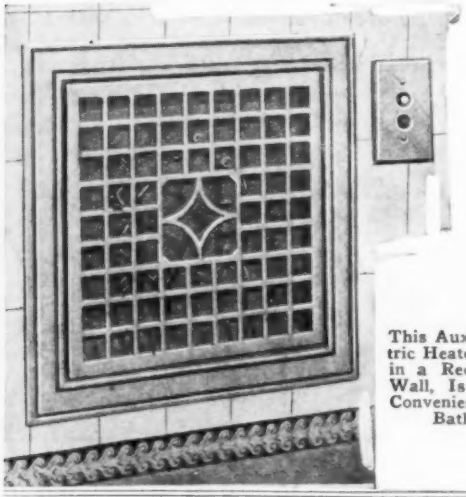
This Handy Manicure Tool, Combining a Brush and a Nail File, Saves Time Wasted in Laying Down and Picking Up Tools

Flatiron Stands Are Usually in the Way on the Ironing Board. This Stand Hooks into a Plate on the End of the Board, Entirely Out of the Way. Raised Edges Keep the Iron from Falling Off

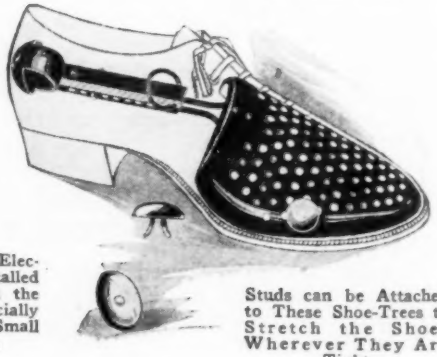


The Blade of This Knife Slides into Grooves in the Fork Handle and Vice Versa. The Two Fit into the Prongs on the Spoon

A Combination Salt and Pepper Shaker Excludes All Dampness When Locked. Pepper or Salt can be Used Separately or at the Same Time



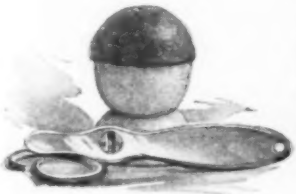
This Auxiliary Electric Heater, Installed in a Recess in the Wall, Is Especially Convenient for Small Bathrooms



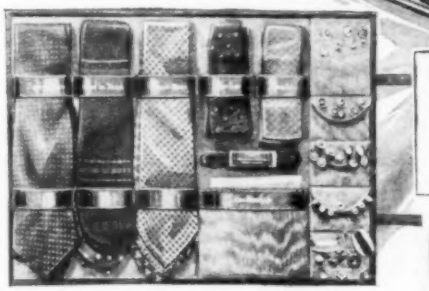
Studs can be Attached to These Shoe-Trees to Stretch the Shoes Wherever They Are Tight

This Electric Warming Plate, Made in England, Is Most Useful to Keep Food Warm until Ready to Serve

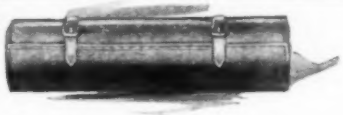
With This Device, It Is Easy to Clean a Ceiling and Unnecessary to Cover the Furniture



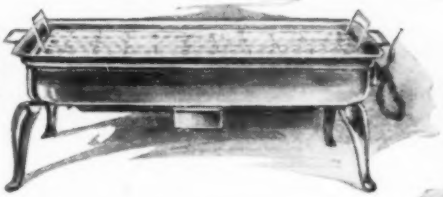
A New Orange Peeler Cuts a Groove around the Orange and Removes the Skin Neatly



Made of Fine Leather, in Styles for Both Men and Women, This Traveling Case Is Genuinely Convenient as Well as Handsome-Appearing. It Takes Care of the Many Necessary Small Articles So Easily Lost or Soiled in Traveling



Here Is an Electric Stove for Travelers. It will Fold into a 10 by 6 by 2-Inch Box

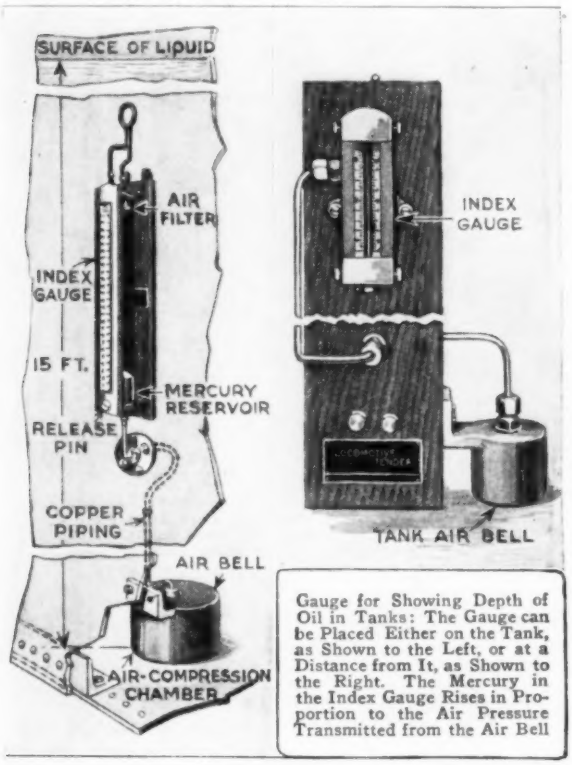


The Valve in the Spout of This Bottle Rinser, Which can be Screwed onto Any Faucet, is Operated by Pressing Down the Bottle

Though Intended for the Kitchen, This Rack Is Useful in the Bathroom, Nursery, or Den. The Open Shelves are Easily Kept Clean. The Towel Bars Fold Out of Sight

SELF-ACTING GAUGE RECORDS CONTENTS OF OIL TANKS

An indicator for showing the contents of oil tanks ashore or afloat, that is self-acting, and affords readings at any moment without any preliminary manipulation by valve or otherwise, and that can be placed at any distance from the tank it is connected with, has been introduced in England. The apparatus in all its forms consists of an indicator resembling a thermometer, its graduated index showing the depth of the oil in the tank by means of a column of mercury. What would correspond to the bulb of the thermometer is a metal mercury reservoir to which is connected a small copper tube which leads to the essential part of the apparatus, called an air bell. This is in the form of an inverted cup, located inside the tank and near the bottom of it, which is filled with air. The weight of the oil contained in the tank necessarily compresses this air, the pressure varying with the depth of the oil. Consequently the air pressure on the mercury varies correspondingly, and the mercury column rises and falls proportionately. Naturally, at times there may be leakage of the air, and to remedy this an air filter is provided with means of connection to an air pump for restoring the lost air.

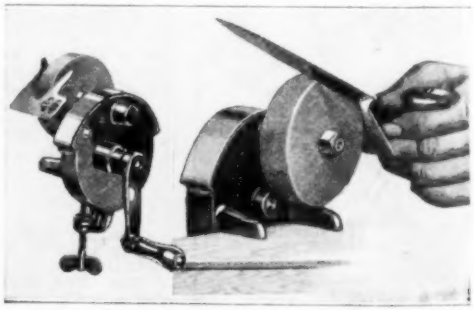


Gauge for Showing Depth of Oil in Tanks: The Gauge can be Placed Either on the Tank, as Shown to the Left, or at a Distance from It, as Shown to the Right. The Mercury in the Index Gauge Rises in Proportion to the Air Pressure Transmitted from the Air Bell

When the indicator is directly connected to the outside face of the tank the preferable means of attaching the copper piping from the air bell is by leading it over the top of the tank, and thence down outside the tank to the mercury reservoir. When it is required to have the indicator at some distance from the tank the piping is conducted to a connection on the face of the tank from which another pipe can be led to any distance, and then attached to the bottom of the mercury reservoir. In oil-burning locomotives, or other places where the bell cannot be conveniently placed inside the tank, a special tank air bell is used which can be located beside the indicator to which it is connected as in the other case.

SIMPLE SHARPENING MACHINE FOR HOUSEHOLD CUTLERY

A new household convenience takes the form of a grinder by means of which any woman can keep her scissors and kitchen knives sharpened as well as an expert. This little grinder is of the type having noiseless gears, inclosed in a metal case and operated by a crank at high speed. It is attached to the kitchen table by means of a clamp. A frame in which the blade of the knife or scissors rests is attached to it. This acts as a guide, holding the blade in the correct position.



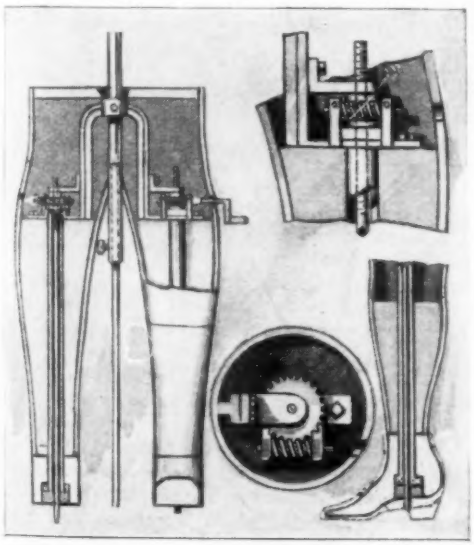
Knife and Scissors Grinder, Showing Operating Side in Left View, and to the Right, the Grinding Side with Blade of a Pair of Scissors being Sharpened

NEW METHOD OF MAKING PAINT BY FIRST POWDERING IT

Paint is now being produced in powdered form. It makes regular paint in the ratio of 5 lb. of powder, with 2 qt. of water added, to 1 gallon of paint. It is made by pouring the water, warmed to a tepid heat, slowly onto the powder in a receptacle, and stirring while pouring, as well as afterward, until it assumes a plastic consistency. After 20 minutes this operation is repeated. Then the mixture is allowed to stand 10 minutes, when it is ready for use.

SIMPLE APPLIANCE ADJUSTS FEET OF CLOTHING DUMMY

An appliance for adjusting the position of clothing dummies, so that the feet will rest flat on the floor, both heels and toes touching, will soon be placed on the market. A U-shaped casting is attached to the center rod of the body. Simple worm gears are fastened to this, in the leg cavities. The gears are operated by a detachable crank inserted through holes in the papier-mâché body. The action of the gears raises or lowers rods passing through tubes in the legs. When lowered, the rods protrude through the bottoms of the feet. By adjusting the rods as needed, the ends force the heels of the shoes down, or allow them to slide up, on the feet, which they fit loosely, till the soles of the shoes rest evenly on the floor.



Dummy-Adjustment Appliance: The Complete Mechanism is Seen at the Left. The Other Figures Show Details of the Gear and the Adjusting Rods

NEW FEDERAL RESERVE BANK BUILDING IN KANSAS CITY

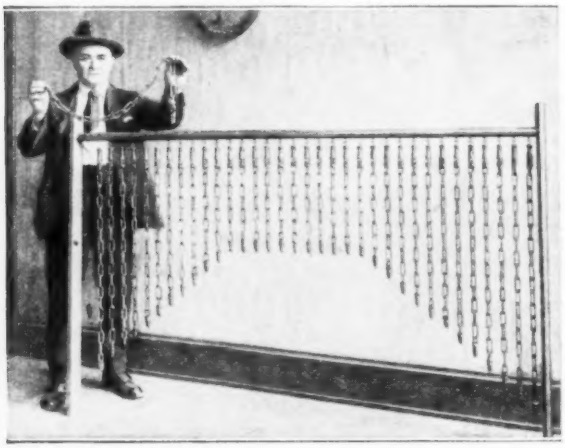
The Federal Reserve Bank Building, which is just being completed in Kansas City, Mo., is one of the largest and most

The New Federal Reserve Bank Building, Nearing Completion in Kansas City, Missouri

complete buildings of its kind. It is 306 ft. in height and will be surmounted by a 100-ft. flagpole. Two lights near the top of the pole will form a beacon visible for 25 miles. The first story is virtually three stories, as provision has been made for putting in two additional stories and still retaining a lobby 35 ft. high. A new sound-absorbing method has been used in the construction of the walls which will exclude all city noises. A complete telephone system, gymnasium, assembly hall, café, kitchen, rest rooms, and hospital have been included in the plans as well as special elevators for the bank force. Two sculptured figures, representing the "Spirit of Industry" and the "Spirit of Commerce," have been placed at the corners of the building.

PATIENT MAN WHITTLES PINE PORTIERE WITH PENKNIFE

Six months' time and 35 pine sticks were required to whittle the strands which compose a wood portière, and all the work



Each of the 35 Strands in This Novel Portière was Cut from a Single Soft-Pine Stick. The Only Tool Used Was an Ordinary Pocketknife. The Carving Required Six Months' Work

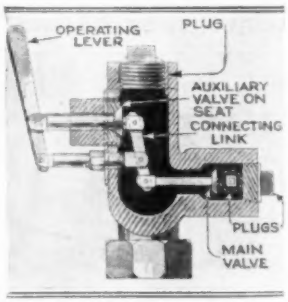
was done with a pocketknife. A little round ball in a cage is the upper terminal, while an art acorn adorns the lower end of each strand, both of which objects are monuments to the unswerving patience of their carver. Not one link was broken during the entire process, and the clever wielder of the pocketknife has many other similar soft-pine ornaments as the result of his remarkable efforts.

DEVICE RENEWS SURFACE OF STICKY FLYPAPER

A device used in Europe makes it possible to renew the surface of sticky flypaper. Specially prepared glue is placed in a round box and a strip of paper passed through a slit in its side. When the strip is covered with flies it is pulled through the box by means of rings at each end. In this way the flies and old glue are scraped off, and a new coating of glue is applied while passing through the box. The trap lasts as long as there is any glue left in the box.

AUTOMATIC SAFETY VALVE FOR BOILER WATER GAUGE

Automatic safety valves for use in connection with the glass water gauge of a boiler, for steam pipes in locomotive cabs, for ammonia gauges, or in the handling of any other fluid under pressure, are now upon the market. In their application to a boiler water gauge they are located above and below the glass water column. In each case they consist of a tubular extension of the socket for the glass, with an elbow leading to the water column on the boiler. Seated in this elbow is a poppet valve which is the main valve, opening or closing connection with the boiler. Seated in the tube above or below this is a small auxiliary valve. Each of these valves has at the end of its stem a pivoted connection to a link between them, which, pivoted at about its center, rocks upon a fulcrum. Sometimes this link is inside the tube, and sometimes it is outside, but in either case an extension of it forms a lever handle which, when pulled outward, opens the main valve and closes the auxiliary. If the water gauge glass breaks, the pressure on the boiler side of the main valve becomes higher than on the other side, and this pressure automatically closes it, at the same time opening the auxiliary valve. The main purpose of the latter is to show the engineer when the main valves are not fully open, because in that position there will be an escape of steam around the auxiliary valve stem, which is not packed.



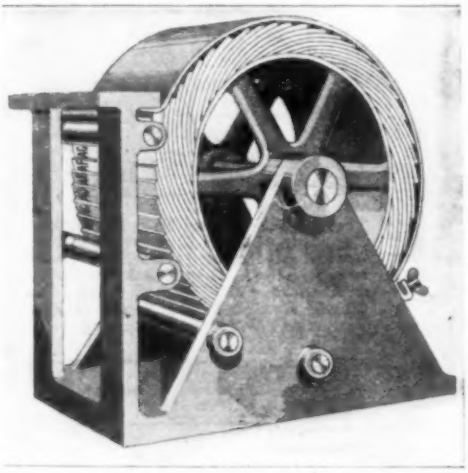
MILK DISTRIBUTION POPULAR AMONG PLANT EMPLOYES

Early in July, one of the large automobile plants put into operation a system of supplying milk to its employes. Milk tickets are sold by the foremen and the milk is distributed from eleven different stations through the plant at 9:00 a. m., noon, and 3:00 p. m. One-pint tickets

cost 7 cents or 15 for a dollar. Great care has been taken to see that the milk is absolutely pure and fresh, and kept properly iced. At first the sales amounted to 650 pt. a day. They steadily increased to the point where as many as 2,500 pt. were sold on hot days. The profits are turned over to the plant musical association toward the support of an employes' band.

ROTATING BOOKS FOR QUICK AND EASY REFERENCE

To facilitate finding pages in dictionaries and reference books, a system of binding pages on a rotating cylinder has been devised. This cylinder is mounted on an axle, on a small stand. The pages normally lie against the cylinder and are held in place by a cover. At one side the stand forms a table. By lifting the cover and rotating the cylinder, any page can be found quickly and easily. It is laid back upon the table for use. Small bars



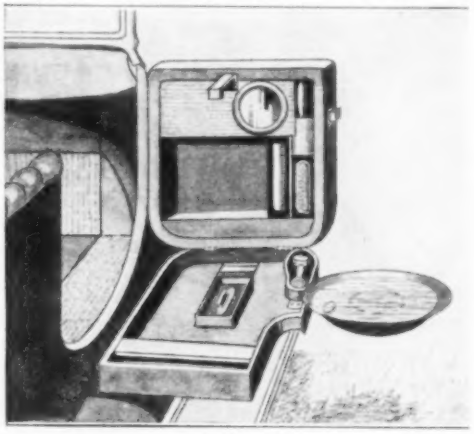
The Rotating Reference Book with the Cover in Place: When the Cover is Lifted the Cylinder can be Quickly Rotated to the Proper Page

serve to fold the pages back into place against the cylinder as it is rotated.

¶ November was designated as "Perfect Package Month" by the railroads, steamship lines, and express companies of the United States and Canada, in order to stimulate interest in the proper packing of shipments. During the month, a thorough educational campaign was conducted, and all the trades and industries were urged to coöperate toward improvement of shipping conditions.

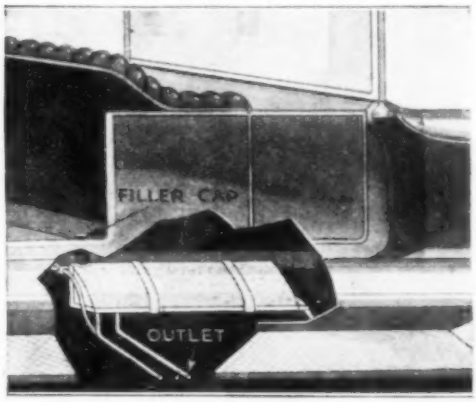
NEW ACCESSORIES INCREASE MOTORIST'S COMFORT

Every motorist has felt the desire to clean up after changing tires on the road,



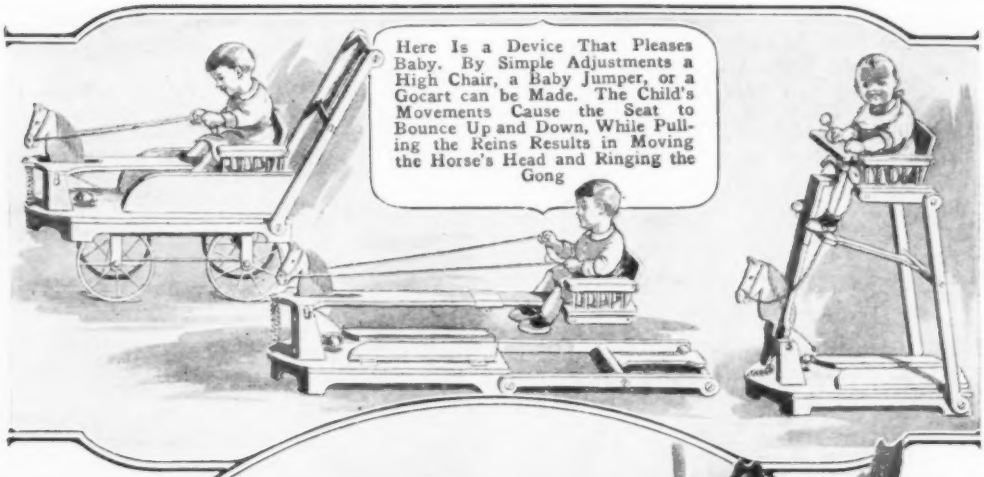
A Complete Toilet Set, Which can be Installed in the Door of Any Car, Is Convenient for Cleaning Up after a Dirty Repair Job on the Road

without being able to do so. A new accessory, which can be attached to any machine, will make it possible to satisfy this want. A sheet-steel case is set into the door of the machine. When opened, it affords a complete toilet set, including mirror, comb, hairbrush, clothesbrush, washbasin, soap, towel, and shoe-shining outfit. Three-gallon tanks are also made to fit under the splash pans at either side of the car. These carry a supply of water for washing or, in an emergency, for the

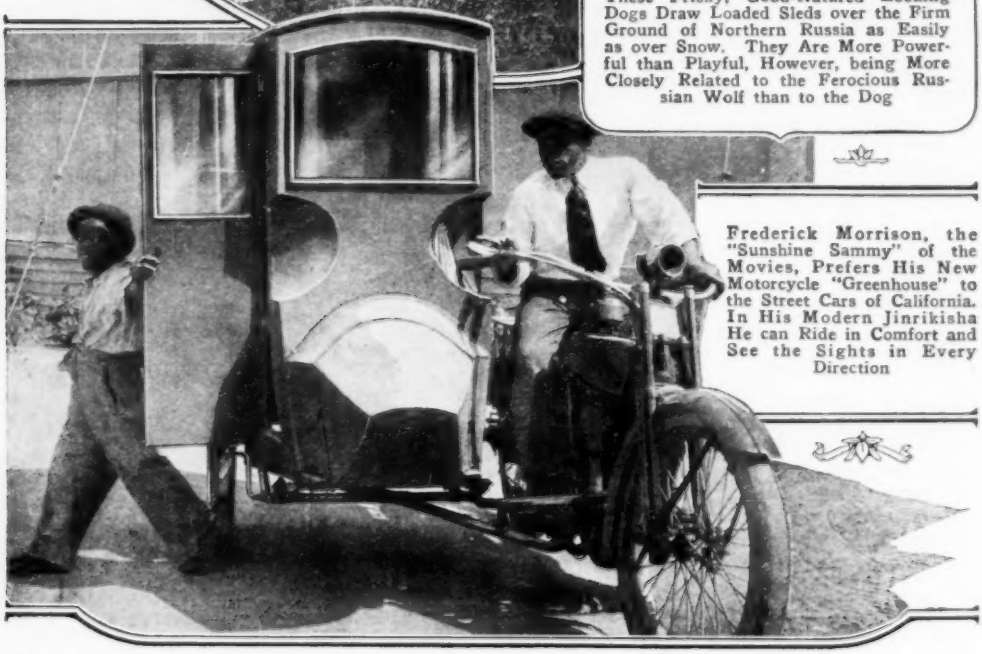


This Tank, under the Splash Pan, Has a Filler Cap Just inside the Rear Door and a Petcock Outlet under the Edge of the Running Board

radiator. Either or both of the tanks can be used for carrying a reserve supply of gasoline if it is desired.

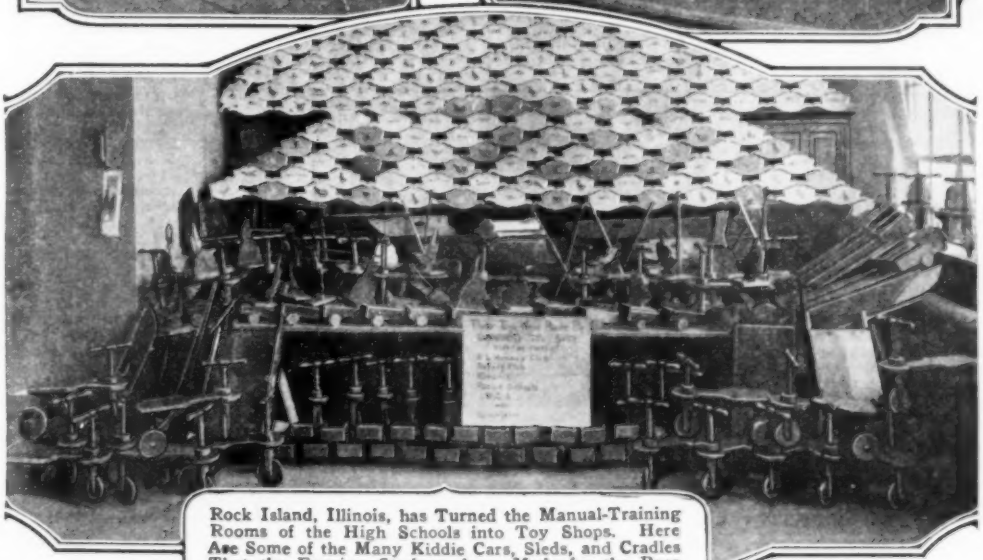


These Frisky, Good-Natured Looking Dogs Draw Loaded Sleds over the Firm Ground of Northern Russia as Easily as over Snow. They Are More Powerful than Playful, However, being More Closely Related to the Ferocious Russian Wolf than to the Dog



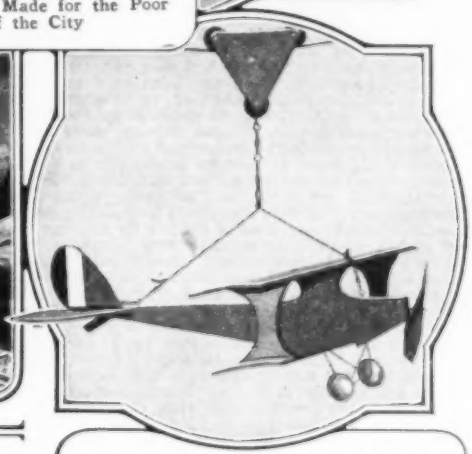
Frederick Morrison, the "Sunshine Sammy" of the Movies, Prefers His New Motorcycle "Greenhouse" to the Street Cars of California. In His Modern Jinrikisha He can Ride in Comfort and See the Sights in Every Direction

Steve Rudecker, of Rocky Hill, Connecticut, has Taught His Favorite Kitten to Strike the Keys of the Typewriter. The Cat Has Double Paws on All Her Legs. Even "Red Hawk" and "Mr. Woodchuck" Get On Well Together When Steve Is About



Rock Island, Illinois, has Turned the Manual-Training Rooms of the High Schools into Toy Shops. Here Are Some of the Many Kiddie Cars, Sleds, and Cradles That the Evening Students have Made for the Poor Little Boys and Girls of the City

These Collie Pups were Given to Their Nanny-Goat Mother Before Their Eyes had Opened. They will be Raised with the Goats and, It is Believed, Grow So Attached to Them That They will Make Excellent Protectors against the Coyotes and Wolves Which Now Menace the Lives of Their Foster Parents



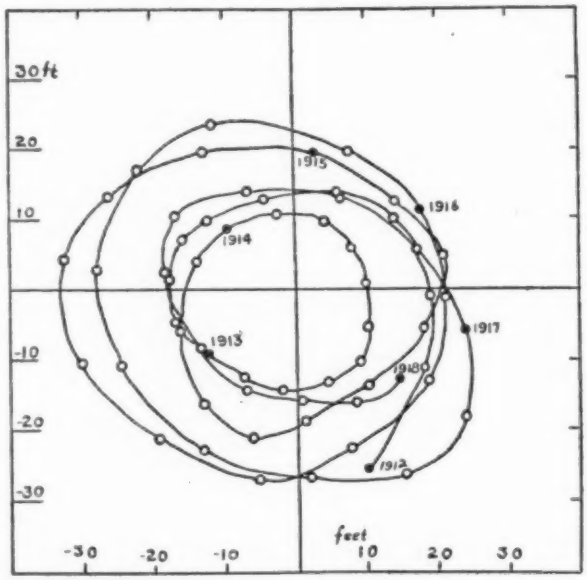
This Airplane Requires a Pilot and a Mechanic. The Children Stand Several Feet Apart Holding the Rope, on Which the Plane Runs, between Them. The First Child Raises His End and the Plane Glides Forward, Propeller Wheel Spinning. When the Process is Reversed, the Plane Swings About and Starts Back

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

By C. A. BRIGGS

THE WANDERING OF THE NORTH POLE

THE North Pole is continually moving with reference to the sky. The path traced by it, or by the axis of the earth where it intersects the surface, consists of a circular loop-shaped figure which is usually confined within an area having a diameter of 60 ft. This motion is produced, first, by the fact that the axis of rotation does not coincide with the axis of the figure of the earth; secondly, winds and ocean currents modify the earth's motion; thirdly, the deposition of snow and ice causes changes in the distribution of the mass of the earth; and fourth, strange to state, vegetation is credited by some with having a perceptible influence. In reference to this last, it may be stated that in the spring and summer the action of the sap in living plants, and the growth of stalks, etc., cause a certain perceptible mass to be moved slightly away from the center of the earth, and most of the land area is in the northern hemisphere. It is interesting to note that vegetation was estimated by one scientist to produce an effect that was about 10 per cent of the total.



Graph of the Path Traced by the North Pole with Reference to the Sky, Shown to a Scale of Feet Measured at the Earth's Surface, and on Either Side of Its Axis, Which, It will be Seen, is Confined within an Area Having a Diameter of About 60 Feet

In the first and theoretical studies made of the subject it was concluded that the polar movement would have two components, one with a period of 10 months and the other, an annual one, of 12 months. The 10-month period was derived from the assumption that the axis of rotation failed to coincide with the axis of figure of the earth. This 10-month period, however, they fail to find. It was only after fixed ideas were abandoned, and data were obtained systematically that satisfactory progress was made. On analyzing the data and letting the components of motion come out as they would, it was found that in place of a 10-month period a 14-month period was present; and the reason for it was soon recognized. It was concluded that the 10-month period originally looked for was changed to a 14-month period on account of the yielding of the earth under the forces acting upon it, a condition not previously considered; and this 14-month period affords important data as to the elasticity of the earth.

MANY INSECTS DISPLAY SENSE OF PROPERTY OWNERSHIP

Several insects have the sense of property ownership, and this appears unconnected with any instinct to protect their eggs or nest. This information was gained from Dr. Paul Bartsch of the National Museum, when he was told of the recent report that a guard at the White House had seen butterflies drive away humming birds from the flowers of an acacia tree in the grounds. According to this authority, many insects will attempt to drive away those who come near their haunts. Dragon flies are often known to make demonstrations to attempt to drive away anything ranging from a rider on horseback to a bird. Nevertheless, they do not succeed in bluffing the kind of birds which are in the habit of feeding upon them. However, any stroller in the woods in reaching an unfrequented pond may have a dragon fly dash at him and rush menacingly by with rattling wings.

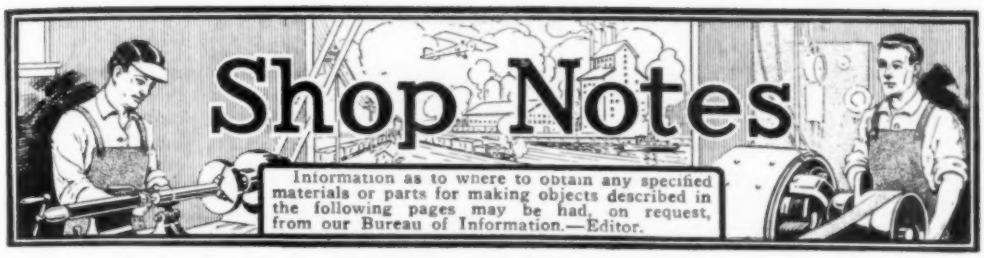
Two kinds of butterflies—the "painted lady" and the "great skipper"—will often attempt to drive away birds or persons that approach their customary ranges. They will fly at the intruder and act as though they could inflict damage, and often they succeed in discouraging their unwelcome visitor by a buzzing of their wings. Some dragon flies and butterflies take up residence; not merely stop in certain localities, but remain consistently in the same neighborhood. One variety of butterfly—the "mourning cloak"—takes up its abode in a hollow tree which it makes its regular home, and in which it hibernates through one or more winter seasons. It will be news to most readers to learn that some butterflies may live through several years, but just how many is not yet known. These butterflies have a very distinct idea of proprietorship of the surrounding territory. Sometimes in winter the trunk is warmed by the sun and the butterfly will essay a flight. When it strikes the cold air outside, it will be chilled and will struggle back to its tree-trunk home, or failing in this, it may fall to the snow below. The sun, striking its dark wings, will melt the snow beneath until the butterfly will descend into a sort of mold.

If food or a nest were concerned, the aggressive conduct of these insects would not necessarily carry with it the suggestion of property ownership, but the behavior of the insects in the instances noted is so akin to human action that the observer seems to understand perfectly the feelings of these small forms of life.

EARTH PRESSURES LIMIT DEPTHS OF MINES

From time to time it has been proposed, for both practical and scientific purposes, to dig a hole in the earth to a very great depth. The temperature of the earth rises as the depth increases, and one plan included the idea of using this heat to produce steam to be employed in driving engines for generating electricity. It was thought by others that valuable ores might be encountered in digging a very deep shaft in the earth. Also, the value of knowing exactly the character of the crust of the earth at great depths would be important to scientific men.

Recently the results of experiments have been announced which indicate that the pressure of the earth at a depth of from 9 to 14 miles would be sufficient to close even small holes in solid rock. The investigation was carried out by determining the pressure required to close up small cavities in the center of spherical specimens of various rocks, including granite, basalt, obsidian, and lithographic limestone. It was found that, at ordinary atmospheric temperatures, the small cavities would begin to close when pressures corresponding to that existing in the earth at a depth of about 14 miles were applied; and allowing for the fact that the temperature increases with depth, it appears that such cavities would very probably be closed at a depth of about nine miles. This shows one limitation on the depth that can be reached by a mine or drill shaft.



A Contractor's Jib Crane

By J. V. ROMIG

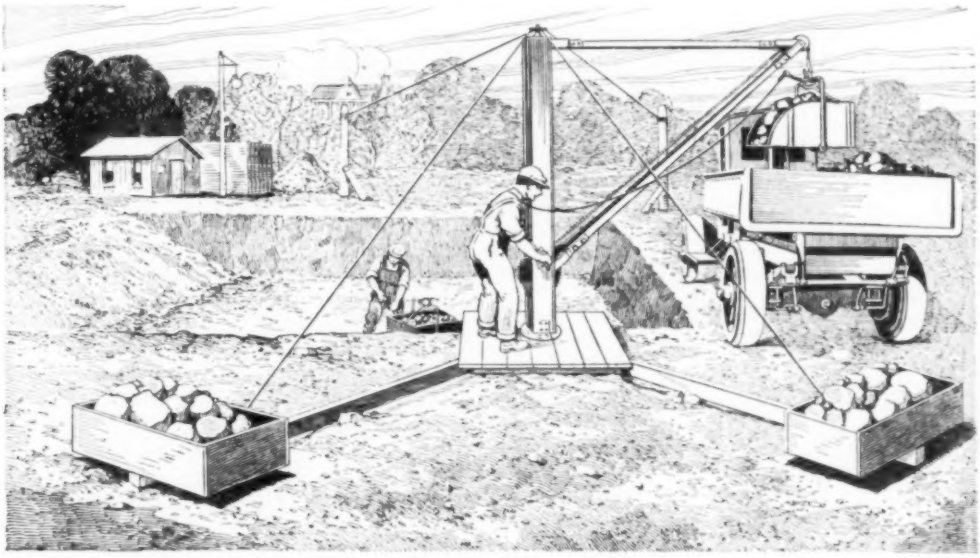
A SMALL jib crane, of the type shown in the illustrations, will save much labor for the small contractor on excavating jobs. It does not cost much to build, and may be built to suit either hand or power operation.

The column is built of two 8-ft. lengths of 8-in. channel iron, connected at the top by a steel-plate crosstie, 18 in. long, and at the bottom by a ⅜-in. steel baseplate, to which the column is attached by riveted knees.

The crosstie and baseplate carry the two column pivots, which are turned up of steel, hardened and tempered, or casehardened, and fastened into place by nuts and lock washers.

The boom is made of good straight-grained hardwood, of a length suited to the general requirements of the contractor, and is provided with the pivot and sheave irons shown in the drawing; these are made of ⅜ by 2½-in. cold-rolled steel or iron, and are fastened to the boom by ⅝-in. bolts.

The pivot irons straddle the drum and gear on the hoisting mechanism, and pivot on the drum shaft. Connecting the column and the top of the boom is a solid tie bar, also of ⅜ by 2½-in. iron or steel, the yoked ends being of the same material. Between the two column uprights is placed the hoisting mechanism. This consists of a crank, upon the extended shaft of which is keyed a 5-in. cast-iron pinion. The shaft runs in brass bushings bolted to the uprights. Meshing with the pinion is an 18-in. cast-iron gear, bolted to the cast-iron cable drum, and both running loose on the drum shaft. The drum may be purchased, or cast from a simple pattern, and both gear and drum should, for long life, be fitted with brass or bronze bushings.

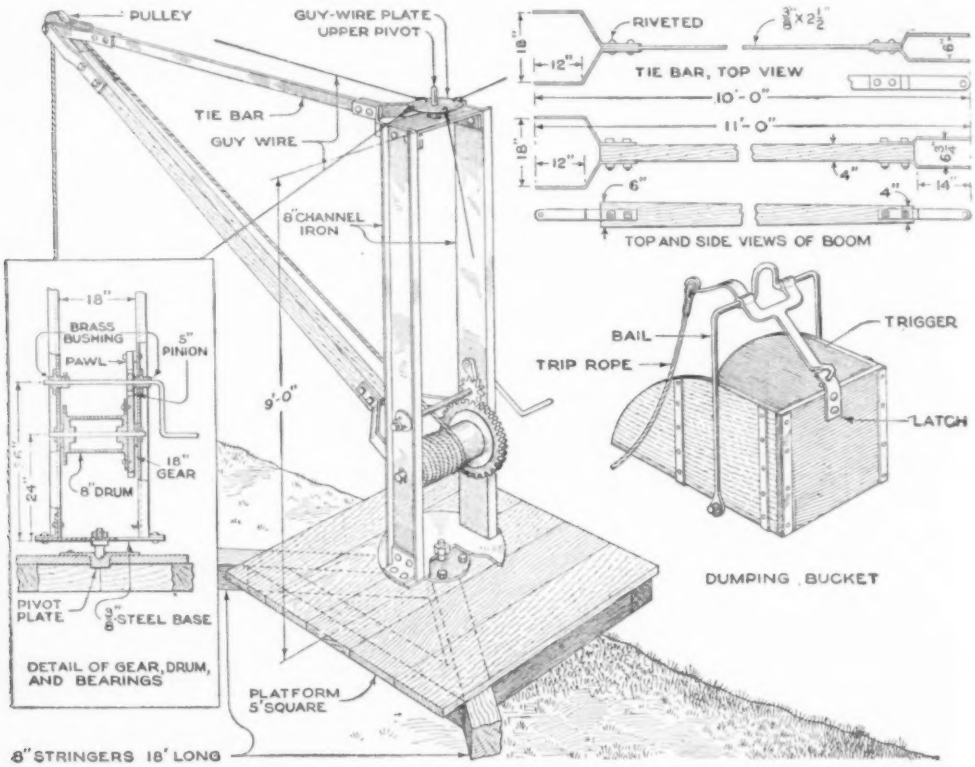


A Simple and Easily Made Jib Crane for the Small Contractor: It may be Set Up and Taken Apart Quickly, will Save Much Labor on Excavating Jobs, and may be Built to Suit Either Hand or Power Operation. The Design may be Modified, if Desired, to Suit Individual Requirements

The hoisting rope may, for general purposes, be ½ to ¾ in. in diameter, or if wire cable is used, this may be 5/16 or ⅜ in. The lower pivot pin rests in a cast-iron plate, bored to fit, which is bolted to a platform, 5 ft. square, built up of 2-in. lumber. The platform rests upon two stringers, 18 ft. long, spread out 120° apart, as shown, and ballasted at their ends by large boxes filled with stone or sand.

A guy wire is fastened, by an eyebolt, to each stringer, and is led to the upper pivot plate. This is made of ½-in. boiler plate, bored and countersunk for the eyes of the guys. The guys are equipped with turnbuckles, to tighten them, and to adjust the column. The front guys must clear the boom and tie bar. The bucket is built of ¾-in. oak, as shown, the bail being pivoted off center, so that the front end of the bucket is the heavier, causing the load to dump itself, when the trigger is pulled. Two of these buckets should be made, so that one may be filled while the other is being hoisted and emptied.

If power is available, a motor may be attached to the pinion shaft.



Details of the Jib Crane: Three Guys may be Employed Instead of Four, as Shown, and the Other Details may be Modified to Suit Individual Conditions or Preferences, While Keeping to the Same General Design

Compound Prevents Squealing Brakes

An automobile-service station makes use of a compound which is applied to the brake bands of automobiles, to prevent the brakes from squealing when tightened. The preparation does not lessen the holding power of the brakes. Powdered resin is thoroughly incorporated with a cheap grade of castor oil, and the mixture is squirted over the brake lining from a large spring-bottom oilcan, first shaking well, to mix the ingredients. Before applying the mixture, the brake bands are cleaned with gasoline, applied by means of another oilcan. The reason for this washing is, that caked dirt is the real cause of the squealing, and the gasoline is used to wash out as much of the road dirt and grit as possible. The gasoline evaporates in a few minutes, and the antisqueal preparation is then applied.

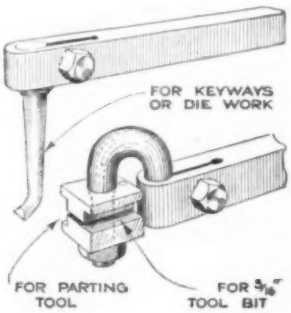
An Improvised Tumbling Barrel

A shop had several hundred pounds of punchings made up, all ready for delivery, but there was a small burr, or fin, around the edges that was objectionable. This burr could easily be removed by putting the whole lot in a tumbling barrel, or "rattler," such as used in foundries for cleaning castings. The shop had no such apparatus, so it appeared that the parts would have to be sent out as they were, in spite of the burr that marred their appearance. The work was being prepared for shipment when some one noticed an empty carbide can.

The carbide can was chucked in a lathe, with the open end out; it was then about half filled with the punchings and the cover screwed on. The lathe was run at slow speed, just fast enough so that the pieces could be heard to drop at each revolution. This treatment was continued for about an hour for each batch. The burr was thus completely removed, and the parts nicely polished.

A Three-in-One Toolholder

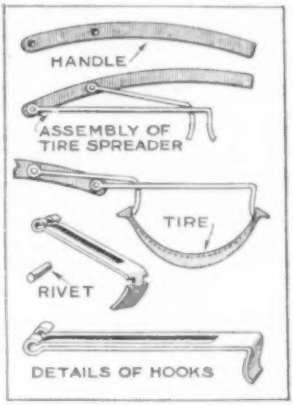
The toolholder shown in the drawing has been in use for a long time on a variety of large work, and has been found to give excellent results. As a shaper tool it is excellent for internal work, such as keyways, annular gears, odd-shaped holes, but especially for blanking dies. As a lathe tool, it has a gooseneck that can be swung to any desired position through a horizontal arc. By inserting a 5/16-in. square tool bit on one side, threading and turning operations can be done, and a slot for parting tools is also provided. A large variety of forming tools can be held by the gooseneck by removing the upper jaw.



In making the gooseneck, a long bar of drill rod is used, which gives leverage for bending; then the small end is turned and threaded, after which the steel clamps are added, and a nut provided for drawing them up tight against the tool.—Carl Spatz, Nutley, N. J.

Quick Spreader for Tires

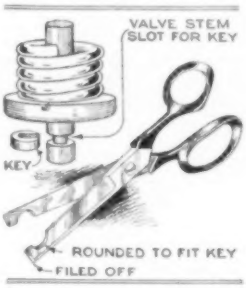
The spreader shown in the drawing is of particular use when inspecting or repairing the interior surface of tires, and especially when applying cemented blow-out patches.



It is made of 3/4-in. flat iron, about 1/8 in. thick, three pieces being necessary, one for the handle, and two for the hooks. The latter, which are slotted down the center for a portion of their length, are attached to the handle by rivets passing through eyes formed in the ends. One hook is longer than the other, and the shorter one has two notches filed in it, so that the portion between the notches is an easy sliding fit in the slot in the longer one. The short one is attached to the handle first, then the longer one slid over it, and the rivet inserted. In use, the spreader, with the hooks close together, is placed in the tire, and a pull on the handle then pushes the hooks apart and spreads the tire.

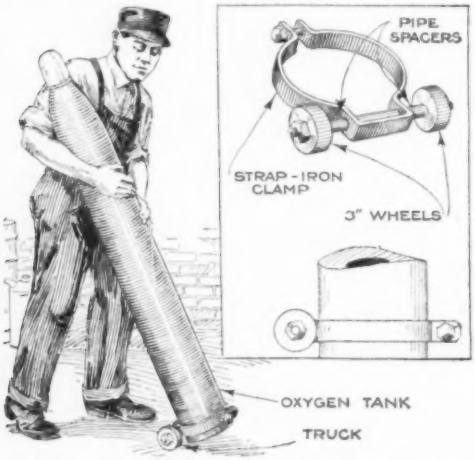
Valve-Key Tool Made from Scissors

The horseshoe or slotted-washer type of valve key, used on some types of automobile engines to hold the valve spring in position, is readily removed and replaced with the tool shown in the drawing. This tool is made from a pair of scissors, by cutting off the points and grinding out the inside edges to fit the outside diameter of the key. When the valve spring has been compressed, the tool provides a good gripping device which holds the greasy key, either removing it or placing it exactly where required, without the usual mishap of dropping it into the engine pan.



Roller Truck for Gas Tanks

In handling tanks of oxygen, acetylene, or other compressed gases, the truck shown in the drawing will be found serviceable for moving the tanks from one point to another with a minimum of



A Handy Little Truck for Attachment to Tanks of Compressed Gases: Tilting the Tank Brings the Weight onto the Wheels So That It can be Pushed to Any Location; Restored to the Perpendicular, It Rests on the Floor

trouble and effort. When it is required to move the tank, it is tilted until its weight rests on the wheels. By bringing the tank to a perpendicular position, it rests on the floor. The truck is made from a piece of flat iron, bent to clamp around the tank, and a pair of suitable wheels, as shown in the drawing.—G. A. Luers, Washington, D. C.

Testing Liquid Glues

Most of the commercial liquid glues are manufactured from the skins, heads, and swimming bladders of fish. Others are made by special treatment of the glue extracted from the hides, skins, and bones of cattle; some, for special uses, are prepared from starch, from various natural gums, or from casein.

Tests made of these products indicate that they differ very widely in strength. Some of them are so weak that they are entirely unfit for woodworking purposes, while others compare favorably in strength with the "hot" glues. The glues tested varied from one which exerted a binding force of less than 50 lb. per square inch to one with an adhesive strength 60 times as great.

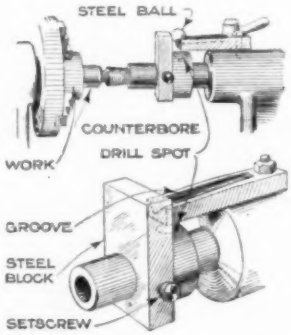
Liquid glues may be tested by gluing together pairs of specially selected hard-maple blocks, placing them in a testing machine and measuring the force required to shear them apart. According to the data thus obtained, a high-grade liquid glue should have an average shearing strength of not less than 1,700 or 1,800 lb. per square inch.

In addition to uniform, high adhesive strength, it is evident that certain other characteristics are desirable in a liquid glue. In its container, it should remain fluid and workable at all ordinary temperatures. It should be elastic and shock-resistant. It should not be unusually susceptible to the action of high temperatures, high humidity, molds, or bacteria.

The study gave evidence that the strength of liquid glue, like that of "hot" glue, depends largely upon its body or thickness, or, strictly speaking, upon its viscosity. Of all liquid glues examined, the thickest or most viscous glue showed the greatest adhesive strength.—U. S. Forest Products Laboratory, Madison, Wisconsin.

A Useful Counterboring Device

The drawing shows a device made to insure accurate counterboring in the lathe, and many other uses for the same tool will doubtless suggest themselves to the user. For any standard depths, this tool is superior to a scale, or to graduations on the tailstock, and work can be machined to .001 in. with very little care.



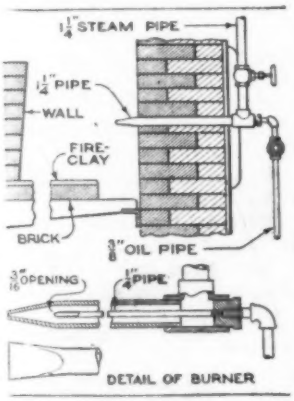
A piece of machine steel is tapered on its upper surface, and a V-groove machined down its center. A hole is drilled in the rear end of this piece for attachment to the tailstock with a capscrew. The second part of the counterboring device is made from a rectangular block of machine steel, bored out to the diameter of the tailstock spindle. It is also turned down to form a boss, 1½ in. long, and a drill spot is made on the upper face of the boss, as illustrated. The completed part may be rigidly attached to the tailstock by a setscrew.

In operation, the parts being attached to the lathe in the manner indicated, the

counterbore is brought up against the face of the work, just touching it. The block is then slid along the tailstock sleeve into close contact with the V-block, and secured with the drill spot directly in line with the center of the V-groove. A steel ball of the proper diameter is placed in the groove, and the counterbore is fed into the work by hand until the ball drops through and is caught in the drill spot, obviously counterboring the hole to exactly the same depth as the diameter of the ball used.

Homemade Oil Burner

The oil burner shown in the drawing was designed and used with satisfactory results in the steam plant of a Canadian porcelain works, and as all parts are standard, a similar burner can easily be made up by any engineer. The 1¼-in. steam pipe has one end flattened out to form a nozzle. By means of a tee and bushing, a piece of ¼-in. pipe, which is rolled so as to have a 3/16-in. opening at the nozzle end, is inserted inside the steam pipe and attached to the oil-supply pipe as illustrated.

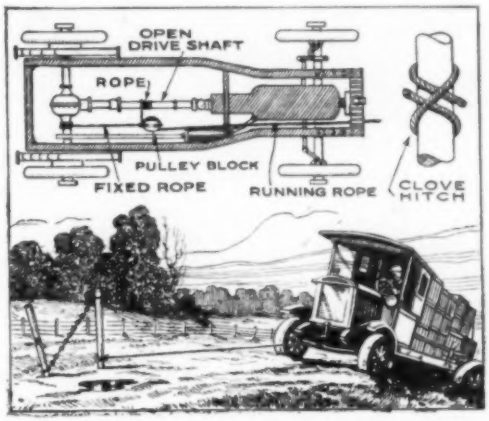


The burner is placed at about the center of, and 4 or 5 in. above, the grates, upon which is laid a layer of brick covered with about an inch of fireclay. A row of bricks can be left out at the front to permit the entrance of sufficient air to support combustion. About 30 in. back from the burner, a wall or baffle should be erected to allow the flame to check and spread. If the oil can be heated close to 220° F. before it reaches the burners, a more satisfactory flame will be obtained. An oil pressure of from 7 to 10 lb. at the burner is essential for good results, and the amount of steam needed to get results can easily be found by experiment.—James E. Noble, Portsmouth, Ont.

¶Holes in thin steel, unless the metal is very hard, are better made with a punch than with a drill.

Extricating a Loaded Truck from Mud

After running his heavily loaded truck into a deep mudhole, from which he was unable to extricate it, the driver, being a



A Method of Extricating a Heavily Loaded Truck from Mud or Sand, in Which the Driveshaft Serves as a Windlass So That the Truck Pulls Itself Out

practical man, after thinking of every other possible method, worked out the idea shown to get the truck loose.

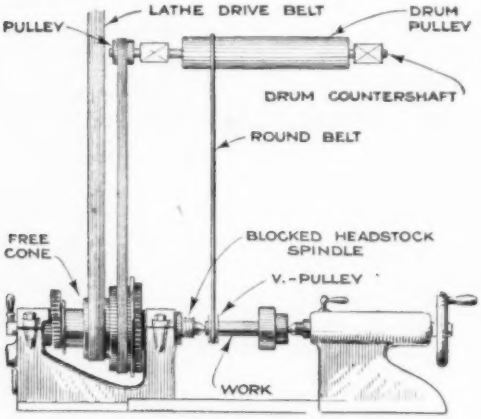
It must be explained, however, that this plan cannot be followed with trucks that have the driveshaft inclosed in a housing. Two stakes were driven into the road some distance ahead of the car, one being used as a brace for that nearest the truck. Then a single-sheave pulley block was fastened to the rear axle by a rope lying parallel with the frame. A heavy rope was made fast near the bottom of the stake nearest the truck, led underneath the front, and through the pulley block to the driveshaft, to which it was made fast with a clove hitch. When power was applied to the shaft, the rope was wound around it, and the truck acted as its own windlass to pull itself out of the mud.—D. V. Wilson, Houston, Tex.

Washing-Machine Display

Moving objects in a display window are always sure to catch the attention of the shopper or passer-by, yet one of the best arguments of washing-machine salesmanship is the absence of exposed moving parts. By operating the machine with the cover thrown back and attaching some object, such as an advertising card or figure, to the "dolly" of the machine, the attachment rises and falls with each movement of the machine, attracting attention and inviting closer inspection.

Finishing Work between Stationary Centers

When turning work the circumference of which must be kept true with a center hole, where several shouldered parts must all be concentric with the axis of the work, or where a piece must be turned end for end in order to machine it all over, it will be found difficult to finish the work accurately if the live center is not true, and this is usually the case unless the center is ground in place, and not afterward removed.



An Arrangement for Finishing Small Work Concentric with Its Center by Revolving the Piece on Dead Centers, the Cone Pulley Running Free and the Work being Driven by a Separate Belt

By borrowing a practice from the grinder—that of using stationary centers—this difficulty may be overcome, as, providing the work has been center-drilled accurately, the circumference of the work will be concentric with and parallel to its axis.

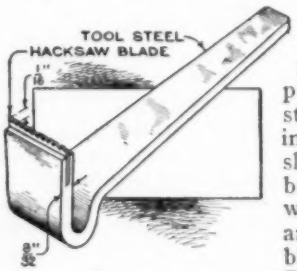
Both centers should fit tightly, and the headstock spindle be blocked so that it cannot turn and so that there will be no play between spindle and headstock bearings. The headstock cone pulley is released so that it runs a narrow V-groove pulley driven onto the arbor or work at any convenient point, this pulley being driven by an overhead countershaft and drum. To drive the countershaft, an extra belt is run from one of the cone steps on the headstock to a pulley on the countershaft. This form of drive requires a hand feed for the lathe tool, but as it is only intended to use the drive for the final high-speed finishing cut, there is no special objection to this. It would be possible, of course, to have the carriage feed separately belt-driven from the drum countershaft. For finishing all over, the work may either be reversed end for end or the grooved pulley itself moved to the other end of the work, the drum permitting the necessary shifting of the belt. Such a device is often of service for finishing small work beyond the usual accuracy of the ordinary lathe.

Sealing Cracks in Storage Batteries

Corroded terminals are caused by the leaking of the electrolyte through cracks and seams around the tops of the cells or around the terminals themselves. While the usual practice is to clean off the terminals and possibly smear them with vaseline, or similar grease, the trouble is bound to recur unless a more permanent remedy is applied. The top of a storage battery is covered with a black wax which is readily rendered fluid by heat. When fluid, it will unite and cool in a solid mass. To repair a seam or crack in the top of a battery and prevent leakage of the electrolyte, use a soldering iron or any similar pointed tool, heated to a temperature sufficient to flow solder, and apply the heated instrument along the crack to soften the wax. While still soft, press the wax down smooth with the point of a putty knife, or other tool, until the crack is completely sealed. This operation requires less time than the removal of the corroded terminals, and once completed, the trouble is cured.

Patternmaker's Roughing Scraper

The tool shown in the drawing is a patternmaker's roughing scraper built along the lines of the ordinary hand scraper but possessing features that make it more convenient. The handle is made from a piece of tool steel, formed as indicated, with a slot cut into the broad end, into which a piece of an old hacksaw blade is driven. The saw teeth protrude beyond the surface just enough to rough the stock without digging in. When the blade is dulled, it can be driven out and a new piece inserted. The special purpose of this tool is the roughening of the joint surface of stock before gluing.—M. E. Duggan, Kenosha, Wis.

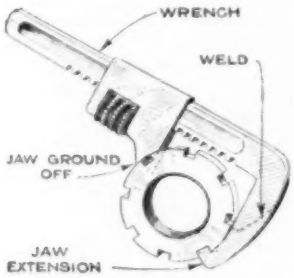


Unloading Kindling Wood

More time is spent in loading and unloading a wagon with kindling wood cut to stove length than in the actual hauling. To make unloading easier and quicker, a strip of canvas, the full width of the wagon bed and somewhat longer, is permanently attached to the tail of the wagon box and spread on the bed. The kindling is thrown in on top of the canvas, and when the wagon is to be unloaded, it is only necessary to pull back on the forward end of the canvas to dump the whole load at once upon the ground. A spreader is fastened into a hem sewed at the free end of the canvas, and by providing a small block and tackle, one man can easily unload a large load of wood, or the horse may be hitched to the canvas, to make the unloading still simpler.—Harold E. Benson, Boulder, Colo.

Making an Adjustable Spanner Wrench

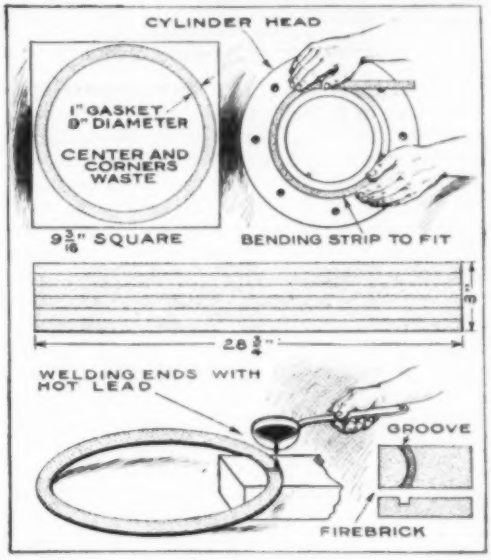
A spanner wrench with a fixed jaw opening will only handle slotted lock and gland nuts with a diameter corresponding to the radius of the wrench. An adjustable wrench for nuts of this type can be made from an ordinary monkey wrench by modifying it as shown in the drawing. With such a wrench any size of slotted nut within the limits of the jaw opening can be turned. The wrench used need not be a new one, as the condition of the jaws is unimportant. A piece is welded to the outer jaw and the sliding jaw is ground off at an angle, a stud being driven into the sliding jaw and a hook formed on the outer one to engage with the slots in the nuts. The extension of the outer jaw should be casehardened or tempered to avoid bending and wearing.



¶Should a piece become stuck on a broach during a cut, whether by breaking of teeth or by crowding of chips in the hole, chuck the broach in a lathe, and turn off the piece. If the broach has no centers, mill the piece off, or cut it in two with a hacksaw.

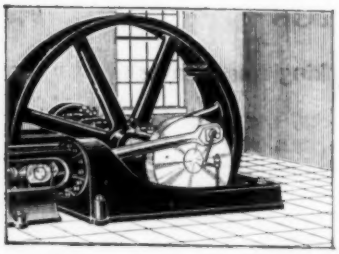
Making Lead Gaskets

Lead gaskets, for cylinder heads and similar joints, can be cut from sheet lead without waste by a method different from the usual one, which wastes approximately 90 per cent of the total sheet, although the gasket is made in one piece. The illustration shows the difference in economy between the two methods. A piece of sheet lead, $9\frac{3}{16}$ in. square, will only yield one 1 by 9-in. gasket, cut by the older method, and, although the center may be used for smaller gaskets, many times it is not. A rectangular piece, 3 by $28\frac{3}{4}$ in., which is of approximately the same area as the first one, will, by cutting strips as shown, yield three 1 by 9-in. gaskets; or six $\frac{1}{2}$ by 9-in. ones, with practically no waste.



Forming Lead Gaskets from Strips of the Proper Width and Length, Results in Perfect Gaskets, and an Economy in Sheet Lead of Approximately 90 per Cent

The strips are easily bent around the flange, as shown, and the ends are clipped off to leave a gap of about $\frac{1}{8}$ in. between the ends. A firebrick is grooved out with a chisel to conform to the arc of the gasket; this is for the purpose of holding the ends in their proper relation to each other while melted lead is poured into the joint. It is best to smear a little soldering paste over the ends before pouring the melted lead, as this makes a better-knitted joint. The joint is afterward dressed down to the same thickness as the remainder of the gasket. Gaskets as small as 2 in. in diameter can be made in this manner.—J. V. Romig, Allentown, Pa.

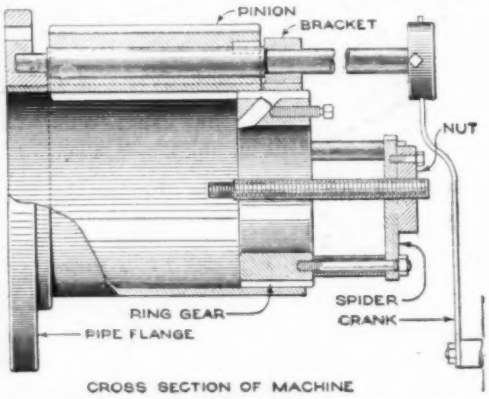


MAKING A CRANKPIN-TURNING MACHINE

By JAMES ELLIS

THE mechanic of a past generation, when confronted with the job of repairing the crankpins of a large side-crank engine, had usually but two alternatives. The first—a big job, and an expensive one when done away from the shop—was to force out the old pin and put in a new one; the second—a most laborious and generally unsatisfactory method—was to file the pin by hand. In even the smallest of modern shops, if much work of this character is done, there is no excuse for using the second of these methods, even if it is occasionally necessary to resort to the first, when a crankpin-turning machine may be so easily and cheaply constructed.

The machine shown in the drawing is very simple to operate, and has sufficient ruggedness to stand countless miles of shipping, and the varying temperaments of machinists. The illustrations clearly show the construction and dimensions of all parts. The principal part of the device, and the one where accuracy is most essential, is a piece of 8-in. pipe, screwed into a heavy flange. Inside of this is a cutter head, made in the form of a ring gear with external teeth, and provided with a slot and setscrew for a cutter. A feed screw is screwed into the end of the pin to be turned, and is connected to the cutter head by a spider or bridge. A pinion, long enough to give considerable travel to the cutter head, is mounted on the flange and pipe, with its teeth projecting through a slot in the wall of the latter so as to mesh with the teeth of the cutter head. The pinion is keyed to a shaft that extends some distance beyond the front of the machine, so that the crank that turns the cutter may be well out of the way of interfering parts. Extensions are made for this shaft to meet unusual situations.



Cross Section of the Crankpin-Turning Machine, Showing the Assembly of the Various Parts: Note That the Feed Nut Is Not a Part of the Spider, but may be Removed

Pipe of 8-in. diameter is selected, because it makes about as large a machine as necessary; if a larger machine is needed, it can be built along identical lines. A machine of this size will turn a 5-in. pin, and it will handle all sizes down to a pin as small as 2 in. The pipe is 12 in. long and is screwed into an extra-heavy 8-in. flange, to remain permanently. If the flange has not a smooth and flat face, it should be trued up after the pipe is in place, as the accuracy of the machine depends to a large extent upon this flange. When the flange is trued, bolt it to the faceplate of a good lathe and bore out the pipe. Do not chuck the flange, as chucking will probably distort it a little, and if the bore of the pipe is not square with the flange, the pin that is trued up will not be parallel to the shaft. The pipe is bored out to 8 3/16 in., which is also the outside diameter of the ring gear. If possible, an internal grinder should be used on the hole. In any event, it should be made as smooth and accurate as possible, as it is not adjustable.

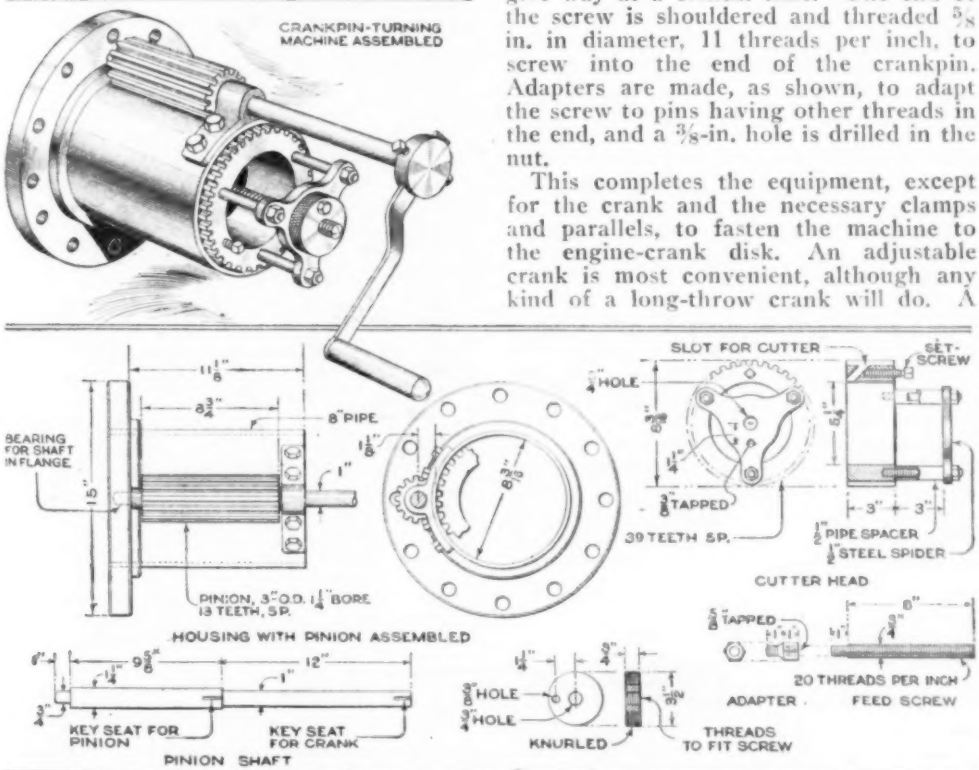
The slot in the pipe is milled, or drilled and sawed, 3 in. wide and 9 in. long, measuring from the flange. No chipping should be done on the pipe after it has been bored, as this may distort it. The 3/4-in. hole in the flange for the end of the pinion shaft is drilled 1 1/8 in. from the edge of the bore. The other bearing for the pinion shaft may be either a casting or a forging, although the latter is stronger and about as cheap. The base is curved to the radius of the pipe and carefully fitted. It will be noticed that the

hole for the shaft in this piece is smaller than the bore of the pinion; this is to avoid set collars and pins. In putting this part of the machine together, the pinion is put in place first, the shaft next, and finally the outer bearing, the shoulder on the shaft keeping it from working out. A keyseat is cut in the pinion, and a key fitted to the shaft.

The cutter head is a cast-iron ring, of 8 3/16 in. outside diameter, and of 5 1/4-in. bore, with 39 teeth cut on its face with a five-pitch cutter. Between two of the teeth, a square slot is cut, at an angle of 45°, so that the slot comes through on the inside at the inner corner, as shown in the drawing. The slot should be cut a little behind the center line, to lessen the possibility of chatter. The slot is made to fit 3/8 or 7/16-in. tool bits; these are held in place by a setscrew, as indicated, a small brass binding piece going between the setscrew and the tool. Three holes are drilled in the edge of the ring, on the side opposite the tool slot, and tapped to take 1/2-in. studs. The bridge, or spider, is made and fastened to the ring by studs fitted with spacers of 1/2-in. pipe, with their ends squared off. A hole is drilled in the center for the feed screw, and a 3/8-in. tap hole is drilled on one side to fasten the nut, which is made separately.

The feed screw and nut are cut 20 threads to the inch, which is as fine as can be successfully used. Of course, a finer screw would give a better finish, but it rarely happens that a cut smooth enough to pass without filing can be taken, so the extra time required to take a cut with a finer screw is not justified. The finer threads are also very weak, which means that they might wear out or give way at a critical time. One end of the screw is shouldered and threaded 5/8 in. in diameter, 11 threads per inch, to screw into the end of the crankpin. Adapters are made, as shown, to adapt the screw to pins having other threads in the end, and a 3/8-in. hole is drilled in the nut.

This completes the equipment, except for the crank and the necessary clamps and parallels, to fasten the machine to the engine-crank disk. An adjustable crank is most convenient, although any kind of a long-throw crank will do. A crank borrowed from an old combination hand and power drill press is just the thing. Two pieces of square cold-rolled steel, 1 in. square and 2 ft. long, should be provided for spacing the flange away from the crank disk. These might be shorter, but the longer size will be necessary in some cases, as will be shown. For the clamps, the machinist is so distinctly "on his own" when it comes to setting up



A Machine for Turning and Truing Up Worn Crankpins of Stationary Engines without the Difficulty and Expense of Removing Them from the Engine or the Labor of Filing Them True: The Only Handwork Needed Is That of Finishing After the Shaft has been Trued

the machine, as disks and webs are made in so many different ways, that no set rules can be given. It is advisable to make a pair of U-shaped clamps, about 3 ft. long, of ½ by 2-in. iron, and to have an assortment of shorter ones with the equipment. About a dozen ⅝ or ¾-in. bolts, of assorted lengths, are also necessary; these may be 12 or 15 in. long, and should have long threads, so that a great number of washers will not be needed, or so that the bolts may be cut to make shorter ones, if necessary.

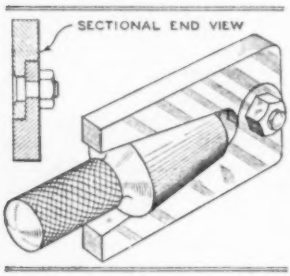
In regard to clamping the flange to the job, a few suggestions may be of assistance. If the pin is in a crank web, the clamping is usually very simple, as the pipe flange will be large enough to extend past the sides of the web, so that bolts may be passed directly through the flange and one of the long U-clamps on the back. If it is in a disk, it is generally possible to get one or two bolts through the upper part of the flange; the long U-clamps can then be used to clamp the lower edge of the flange.

The bore of the pipe can be trued up with the pin by calipering before the cutter head is put in. Some pins have a shoulder that can be used for this purpose. If the pin is worn all the way up to the face of the disk, the setting is a little more difficult, and more care will have to be exercised in order to get the cut started evenly. With the cutter head in place, the bit can be set just to touch the pin and the setting corrected. The tool slot can then be brought under the edge of the slot in the pipe, and a rod used to tap the tool forward a little. It is better to take several comparatively light cuts than to try to get the pin true in one or two cuts. A heavy cut is much harder to pull than a light one, and will be much more tiring; the heavy cut will probably take as long as two light cuts, and there is the possibility of the machine slipping when pulling a heavy cut.

Before setting up the tool, it is well to find if the disk runs true. It sometimes happens that the shaft or the disk is sprung a little, and if the pin is turned up square with the disk in this condition, it will not be parallel to the shaft. If the shaft is in the shop, it is a simple matter to put it in a lathe and correct the error, if any. If the shaft is on the engine, it may be turned over to find if the disk runs true. In case it runs out, the following method may be used to get around the difficulty: The two long parallels are clamped to the face of the disk in the position they will occupy when the machine is put on. The distance of one pair of the ends of these bars from some fixed point is measured, the shaft turned over 180°, and the distance between the same point and the other ends measured. When a difference is found, shims are placed under the low points till the plane of the bars is square with the shaft, as evidenced by all points on the parallels being the same distance from the fixed point. Now the flange of the crankpin turner is put on the bars and clamped. Care should be taken to see that the bars are supported under the points where the clamps bear, otherwise the careful location of the bars will be of little or no avail. It is good practice to put strips of paper between the bearing surfaces, as this will greatly reduce the possibility of slipping.

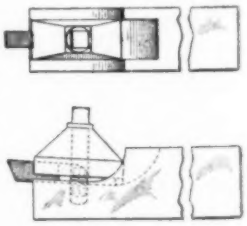
A Simple Taper Gauge

The regular type of taper gauge can, as a rule, be used for only one particular kind of taper, but that illustrated may be adjusted to conform to many different tapers. As will be noted in the drawing, the gauge consists of two blades pivoted on a pin at the end, the joint being halved, as shown in the end view. The operator must use a template to suit the desired taper.



Toolholder for Short Bits

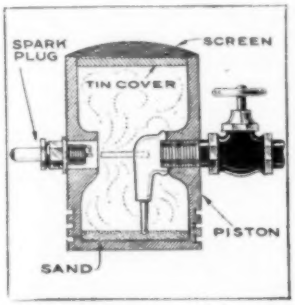
The toolholder shown in the illustration was designed to use up the pieces of tool bits that are thrown away when they become too short to be used in the regular holders. The nose of the shank, which is made of machine steel, is milled out, as shown, and a groove, the same width as the bits to be used and about 3/32 in. deep, is cut as indicated by the dotted lines. The clamp piece is shaped out of machine steel, grooved, and drilled to clear the clamp screw.



This screw is made like the regular toolpost screw, with a shoulder and squared head, and works in a hole drilled and tapped in the center of the groove in the shank. The clamp has a small toe machined at the back end; this fits the groove, preventing side play, and a short spring may be fitted between shank and clamp, to keep the clamp raised when inserting or withdrawing the bit. All parts should be casehardened.

Sandblast Spark-Plug Cleaner

For the garage that has a supply of compressed air, there is nothing in the line of spark-plug cleaners more convenient and effective than the miniature sandblast illustrated in the drawing.



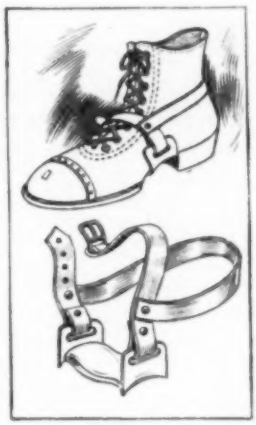
An old piston forms the body of the device, and air from the storage tank is conducted to the simple nozzle through one of the wristpin holes. The nozzle is made of a street elbow, provided with a small nozzle to pick up the sand, while another is inserted into the elbow at right angles, to blow the sand against the spark plug. The cleaner is covered with a screen, fine enough to prevent any of the sand from passing through, but permitting escape of the air. By opening the air valve and giving several quick blasts, with an air pressure of about 40 lb., the sand is blown around all parts of the plug, cleaning it thoroughly. The spark plug is inserted through the wristpin boss opposite the nozzle.—Edwin Schubach, Chicago, Ill.

Cooling Hot Bearings

One of the best treatments for a hot bearing consists in loosening the bearing all around and liberally applying cylinder oil through the oil holes. Another good cooling preparation is composed of about one part of graphite to 10 parts of heavy engine oil. If the heating continues, the bearing can often be run down smooth by running with a light load while the bearing is kept flooded with a very thin mixture of flowers of sulphur in clean water.

Comfort for Ladder Workers

Workmen whose duties require them to stand on the rungs of a ladder for any great length of time experience considerable discomfort in the arches of the feet. For the prevention of this, the steel "shoes" shown in the drawing will be found worth while making. They are made from strips of sheet metal of the proper length and width, and the ends are turned up and slotted to accommodate the attaching straps. The horizontal part is curved to conform to the curvature of the arch of the shoe. In use, the shoes are strapped to the feet in the manner indicated, and the workman can stand on a ladder indefinitely with as much comfort as when standing on the ground. —Jesse L. Blickenstaff, North Manchester, Ind.



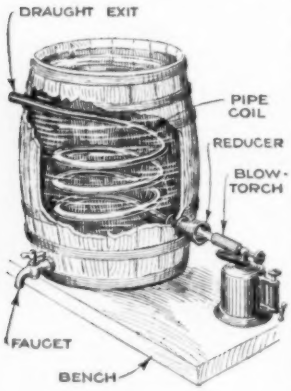
Pan Protects Outdoor Order Pad

Grocers, draymen, and others who maintain outside stands for the reception of their patrons' orders, often lose a good many calls because of the insufficient protection provided for their order pads.

The drawing shows a neat and entirely weatherproof covering for the order pad made from an ordinary bread pan, which is hinged to the stand, as shown. For convenience, a small handle, or knob, is fastened to the front end of the pan, to throw the pan up out of the way when the pad is to be used.—B. Fox, New York, N. Y.

Heating Water with a Blowtorch

The drawing shows how a barrel of water can be heated with a blowtorch to furnish warm water for the shop, or, in cold weather, for watering stock, mixing cement, and similar purposes. A coil of 1½-in. pipe is inserted into the barrel, the lower end being provided with a flange and reducer. The flange is placed on the inside of the barrel and packed to prevent leakage past the pipe, and the reducer is screwed onto the outside end, forming a funnel-shaped opening for the flame from the blowtorch. With the tip of the torch burner about an inch from the coil, the flame will be thrown into the pipe, and the hot air carried upward to the outlet will speedily heat the water.



Hints for Draftsmen

A wedge-shaped point on the drawing pencil is preferred by many draftsmen; the point should be ground until the working edge is 1/32 in. wide. A commendable habit to acquire is that of always setting the scale close to a part that is to be dimensioned, immediately before writing the figures. The aim is, of course, to secure a graphic check on the figures, and it is presumed that the piece is drawn to scale, or that, when the drawing of the work has been shortened with the object of picturing it within a limited space, the dimension has been reduced by an exact number of units.

When working on tracing cloth, the table covering should be of white paper. On this white background it is sometimes convenient to ink in the outlines of standard-size detail sheets.

The sequence outlined below should be observed in tracing: 1, center lines; 2, circles and arcs; 3, invisible lines; 4, heavy lines; 5, dimension lines; 6, arrowheads and dimensions; 7, notes, and 8, section lining.

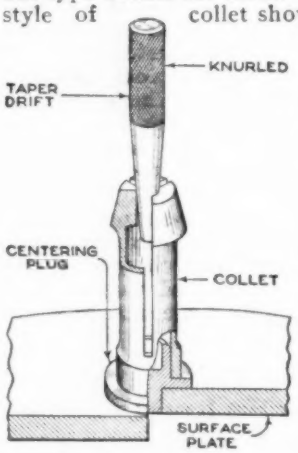
This sequence is based on practical considerations. For example, center lines should be drawn before circles because ink, entering holes made by the compass point and spreading, is difficult to erase, and "invisible" lines should be drawn before heavy lines because, should a blunder be made, the dotted "invisible" lines can simply be transformed into heavy ones. Vertical lines should be drawn before horizontal ones, since the former are guided by a transparent triangle and the latter by a wooden T-square, and thus the vertical lines will serve as stopping points for the horizontal ones.

Straightedge Made from Old Razor

An old razor, or bayonet, can be made into an excellent knife-edge straightedge. All that is necessary is to straighten the edge on the surface grinder, and then lap, with a rocking motion, on a good lapping block. The time required in machining and hardening is saved, as these blades already are hard, and also of the desired shape. If a razor is used, the handle may be left on, forming a protection for the edge when not in use.

Making Push-Out Collets

The drawing shows an idea that has been worked out in the making of push-out-type collets for screw machines. The style of collet shown by the illustration has three jaws, and is made in a range of sizes from 1/8 to 2-in. capacity.



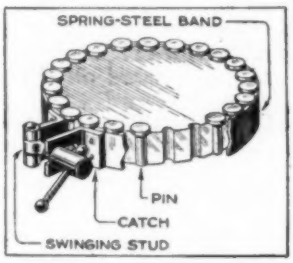
The first operation in making the collet is to machine it out complete by first roughing in a chuck and then finishing on an arbor, allowing .020 in. to grind in the bore. The slots are then completely milled out, after which the work is placed in the furnace. The critical point of the work is the following operation: After the collet has been heated to the required temperature and "soaked" for the proper period, it is withdrawn from the furnace and stood vertically on a cast-iron surface plate with a centering plug, as shown. This plug

is bored out at the top, so as to heat easily and not chill the collet; then, a taper drift is driven into the top of the collet opening, expanding the jaws, after which the work is quenched and drawn for temper. The collet is then cleaned up and placed in the nosepiece of the screw machine on which it is to be used, and the bore ground to size with a portable electric grinder.

Collets made in this manner have entirely overcome the tendency to remain closed when working, and have a good amount of inherent spring, no matter how long in use. As they are ground to the machine, they are very accurate, and, altogether, the method has been found superior to leaving a web that is later ground out and depending upon distortion for the spring. However, it should be noted that the important part of the operation is the amount of opening the jaws get while heated, and considerable practice is required to get the right result.

Fixture for Grinding Small Pins

The fixture shown in the illustration, while, in this instance, used for a grinding operation, may also be used for other operations, such as drilling or milling.



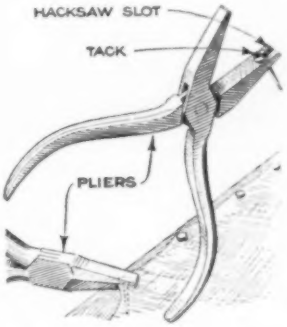
We had some 20,000 small pins to manufacture, the heads to be ground on the top surface, and as it was, of course, too slow a task to grind them singly, this fixture was made to handle 23 at one time.

The main part of the tool is a cast-iron block, milled with semicircular slots on its circumference, to suit the pin bodies. A band of spring steel, fitted with a bracket carrying a swinging stud, and a slotted catch, completed the fixture. All that was necessary was to place the pins in position, tighten the band, and proceed with the grinding. Loading and unloading of the fixture are performed rapidly, and this simple arrangement made possible a substantial saving.—J. H. Moore, Toronto, Can.

¶For extra ventilation in the lower berth of a sleeping car, use a folded newspaper, or pencil, to hold the window open.

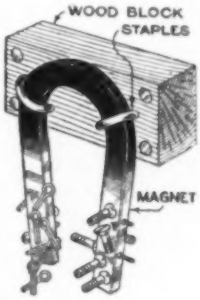
Pliers for Driving Tacks

Upholsterers, and others having considerable tacking to do, experience more or less difficulty in holding very small tacks and pressing them through the material into hardwood. The drawing shows how a pair of long, flat-nosed pliers was altered for the convenient handling of such small tacks. A slot was cut into one jaw, large enough to admit the shank of the largest tack used. When in position, both tack and material are held firmly by the pressure of the opposite jaw against the head. If very short tacks are used it may be necessary to grind or file away some of the metal from the underside of the slotted jaw to permit the point of the tack to project a sufficient distance. —L. Powell, San Francisco, Calif.



Magnet Holds Screws and Cotters

An assortment of small screws and cotter pins can be kept so that there is no danger of spilling them over the bench, when a can or box is upset, by using a simple horseshoe magnet, preferably one from the magneto of an old car. The magnet is fastened to some suitable support with staples and the right size of screw or cotter is before the mechanic at all times. It is, of course, understood that the magnet will not attract screws or pins made of brass or copper, or of other nonferrous metals.

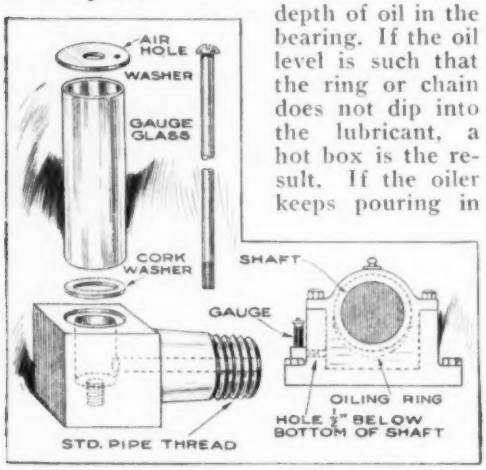


Concrete Feeding Floors

Concrete feeding floors, or barnyard pavement, should slope toward a gutter leading to a concrete manure pit. In this way, all the liquid content of the manure is preserved, and the surroundings are kept more nearly sanitary.

Oil Gauge for Bearings

Large-ring and chain-oiling journal boxes are very rarely fitted with gauges, whereby the attendant can tell the exact depth of oil in the bearing. If the oil level is such that the ring or chain does not dip into the lubricant, a hot box is the result. If the oiler keeps pouring in oil until it runs out along the shaft, much oil is wasted.



An Oil Gauge for Large Journal Boxes That Tells the Attendant Just How Much Oil is Contained in the Bearing, Preventing Heated Bearings and Wasted Oil

A simple gauge that prevents this uncertainty and waste, is illustrated by the drawing. The lower part of the gauge is turned from a piece of cold-rolled steel, 1 in. square by 2 in. long. This is chucked in the lathe and taper-turned, to the proper size for ½-in. pipe thread, for a distance of 1 in., then threaded. A ¼-in. hole, 1½ in. deep, is drilled in this end while still in the lathe. The piece is then rechucked, and a ½-in. hole, ⅝ in. deep, is drilled at right angles to the first one, as shown. Another hole is afterward drilled in the center of the ½-in. hole, and tapped to take a ¼-in. screw. A recess, ⅝ in. in diameter, is turned in the upper face to seat a cork washer and glass tube, the latter being a piece of standard ⅝-in. gauge glass; the glass should not fit tightly in the recess. A ⅝-in. iron washer, with a ¼-in. hole through the center and a 1/16-in. hole ⅛ in. from the edge to allow the air to escape, together with a long ¼-in. screw, complete the gauge.

The bearing is drilled about 1½ in. below the bottom of the shaft, and tapped to take the threaded shank. The steel body should be screwed in before the glass and washers are assembled. Rubber becomes soft and deteriorates rapidly in contact with oil, for which reason a cork washer is used.—Edwin J. Bachman, Fullerton, Pa.

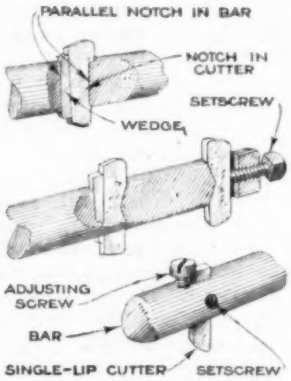
Uses for Banana Stems

The stem, or stalk, of a bunch of bananas after all the bananas have been cut off, has very few uses and is more or less of a nuisance. However, it can be used to clean the blades of tobacco cutters, such as used to divide a "plug" of tobacco into merchantable quantities. This is done by using the cutter to chop a stem into short pieces, the juice cleaning the blade. It has also been found that chicken mites have a peculiar liking for the juice contained in the stem and will desert the fowls, temporarily at least, and collect upon the surface of the stem, where they can easily be seen and destroyed.—Howard Fowler, Rogers, Ark.

Locking Cutters in Boring Bars

A boring-bar cutter may be quickly extemporized by grinding a piece of old file, or other hardened-steel stock, and fitting it to the boring bar without drawing the temper. After being locked in place, the cutter may be ground to size in the lathe by means of a toolpost grinder, then removed and the relief ground on the blades.

One way to lock the cutter, without changing the slot in the boring bar, or fly-cutter bar, is to grind a shallow notch in the front end of the cutter, the length of the notch being equal to the diameter of the bar, using a narrow-faced grinding wheel with the corners dressed off sharp and square. The rear edge of the cutter is slightly tapered, and the cutter must be narrower than the slot by an amount sufficient to drive in a thin steel wedge. The notch in the cutter fits over the edges of the slot in the bar, preventing sidewise movement, while the wedge holds it tightly in place.



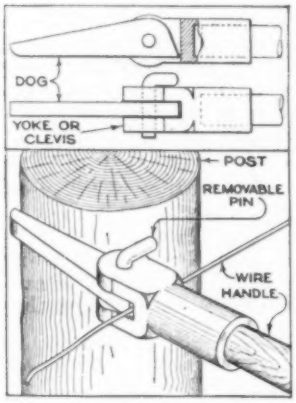
Another way is to grind an angular notch either in the front or rear edge of the cutter, depending upon whether it is to be held in a slot near the end of the bar, or nearer the middle. The bar slot is then filed to the same angle, and if a wedge is used, the cutter may be tapered as before, or the rear end of the bar slot filed to a taper. If the cutter is held near

the end of the bar, the rear end is notched and no wedge is required, a setscrew holding it against the beveled end of the slot. The slot in the bar must, of course, be wider than the cutter to permit its removal.

The lowest drawing shows a simple means of adjusting a single-lip boring cutter. A hole is drilled and tapped in the bar, just behind the cutter slot, and a screw with a large head inserted, the bottom of the head resting on the heel of the cutter. Turning the screw in will feed the cutter out, while it may be locked by a setscrew at right angles to the slot. The cutter lip must extend far enough beyond the bar to prevent the adjusting screw opposite from fouling the bore in the work.

Positive-Grip Wire Stretcher

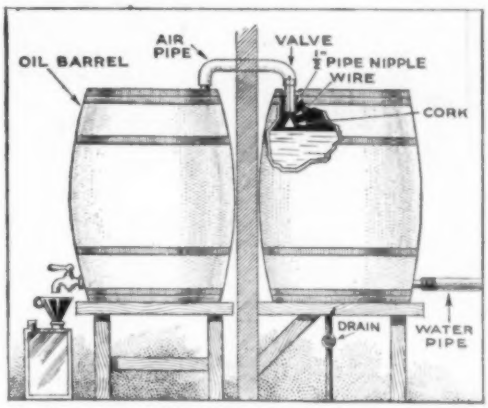
The wire stretcher shown in the drawing can be quite easily made from parts that are to be found around the average farm scrap pile, shop, or barn, which avoids the delay incident to purchasing a suitable stretcher and, also, the cost. The clevis, or yoke, which can be obtained from a wagon or similar implement, together with a handle of suitable length from an old rake or hoe, are two of the four parts necessary. The dog is made from a 6 or 8-in. length of iron, that has a hole drilled through it for the insertion of a loose-fitting pin; it is made removable to facilitate placing the instrument upon the wire to be drawn up. When the wire, which may be plain, stranded, or barbed, is caught in the stretcher, the dog is placed against one of the fence posts, which serves as a fulcrum. When the wire is stretched at each fourth post, as firm and tight a fence as desired is obtained.



¶To find the number of gallons of paint required to cover a surface, two coats, divide the area of the surface, in square feet, by 200.

Drawing Viscous Fluids in Cold Weather

Heavy oils, molasses, and similar viscous fluids that refuse to run from a barrel or other container in cold weather, can be forced from the container by the pressure of air, and, if no other means of obtaining compressed air are available, the arrangement illustrated can be used. An empty barrel is connected to the stock barrel by an air pipe, as indicated. The empty barrel is also connected to a water pipe so that the barrel can be filled with water, which will compress the air inside. A simple valve in the air pipe prevents water from entering the stock barrel; this valve consists of a conical cork float that rises and closes the air pipe when the water reaches it. A drain is provided for emptying the water-filled barrel so that the operation can be repeated. If a supply of compressed air is available, all that is necessary is to connect the air line to the stock barrel and apply the pressure as needed, controlling it by a suitable valve.—G. G. McVicker, North Bend, Neb.



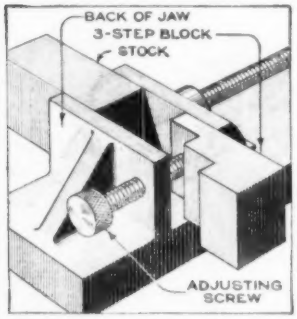
An Arrangement for Forcing Fluids from a Container by Air Pressure: It may be Applied to Heavy Oils, Molasses, and Similar Liquids

Erasures on Tracing Cloth

Few who have used tracing cloth have failed to observe that it sometimes wrinkles when an eraser is used, and sometimes not. The reason for this is that, in weaving the cloth, the threads that run lengthwise in the finished product are always held taut, while the cross threads are less tightly drawn. Consequently, if the eraser is always moved parallel with the tight threads wrinkling will not occur. Tracing cloth, when torn lengthwise, will part in a straight line, while if it is torn crosswise the edges will be ragged.

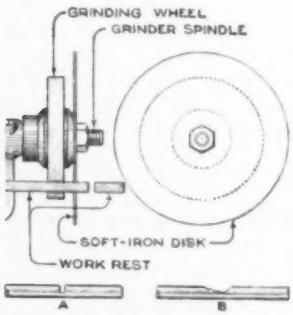
Sawing Short Bar Stock

To hold a short piece of bar stock in the power-hacksaw vise is rather difficult, unless another piece of stock of the same size is available to put in the opposite side of the vise, to prevent the jaw from twisting sidewise when the work is clamped. To overcome this difficulty, an adjusting screw is inserted into the left side of the stationary jaw. This adjusting screw must be the same size as the one that tightens the vise. With the three-step block, which forms part of the arrangement, very little adjustment of the screw will be necessary for various sizes of stock.—Charles Homewood, Ontario, Calif.



Hardened Steel Cut by Soft-Iron Disk

To say that a bar of high-speed steel may be cut into lengths by a "saw" made of soft sheet iron seems absurd, yet it is something that can be tried by anyone owning a small power grinding stand, or even a hand-power bench grinder. Besides furnishing interesting experimental work, this method is of practical value in cutting lathe bits, made of self-hardening steel, hardened drill rod, and similar material.



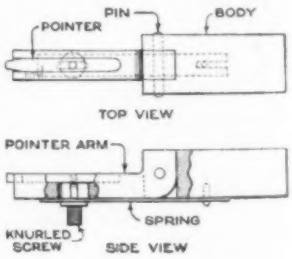
All that is required is a disk of soft sheet iron mounted on a shaft that can be rotated at high speed; then, if the stock to be cut is held against the edge of the rotating disk, the latter appears to act as a narrow grinding wheel and will cut through the piece. If a grinding stand is at hand, the easiest way is to mount the disk upon its spindle, clamped between the end nut and clamp collar; or the grinding wheel may be removed and the disk clamped in its place between the two collars, an extra packing collar usually being needed.

For experimental work, a disk of thin tin (tinned iron) may be tried, but unless this is carefully cut and fitted to run true, a heavier sheet, say, No. 24 gauge iron, will give better results. Different materials appear to give varying results; in general, the softer the iron used, the better. Steel and some kinds of sheet iron are not satisfactory. In cutting the disks, select a perfectly flat sheet, and take care that it is not dished or warped in cutting; drill the center hole the exact size of the grinder spindle, clamp the sheet in place, and, while rotating the spindle, slowly scribe the circumference of the disk. As the wheel should run at high speed and can be run faster than a grinding wheel of corresponding diameter, make it larger than the grinding wheel in use on the stand so as to obtain a greater peripheral speed. Cut carefully to the scribed line, mount on the spindle again, and test for true running. Rotate slowly and true up the edge with a file, and the disk is complete. If of suitable material and true-running, a fairly clean cut, as at A, will be made through hardened steel held against the disk and supported on the grinder work rest; if the disk wobbles, the material will still be cut, but in an irregular groove, as at B, as though it had been held against the rounded-off corner of an abrasive wheel.

The trying out of different-sized disks or running them at varying speeds, using different thicknesses of sheet iron, of several grades, will prove both interesting and instructive.

A Boring-Mill Indicator

The tool shown in the drawing will save considerable time when setting up work on the boring mill, when such work is held in the chuck.



The body, which is held in the tool-holder, is slotted to take the pointer arm, and drilled for the pin that holds the two parts together, allowing the pointer arm to be moved in but one direction. The pointer arm is also slotted to accommodate the

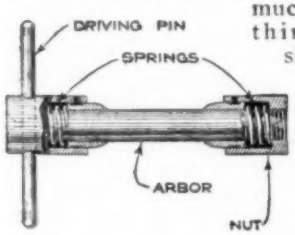
pointer, which has a slot through its center to take the knurled screw, as shown. A flat spring, on the back of the arm, is held in place by the knurled screw, and by a pin at the opposite end.

When the tool is assembled, a line is scribed on the pointer, and the pointer arm is graduated in any suitable manner, preferably thirty-seconds of an inch.

With the tool fastened in the toolholder of the machine, it is brought down until it touches the highest part of the work held in the chuck. Should the indicator be accidentally fed down too far, the hinged joint permits the point to spring back as it touches the revolving work. When clear again, the spring returns it to normal position. With the indicator just touching the highest spot, the table is revolved a half turn and the pointer is adjusted until it touches the low spot of the work, the reading on the scale is taken, and the opposite side of the work, which, of course, is the high side, is then rapped down until the low side has been raised one-half the original reading. The work will then be parallel with the table on that side and should be marked. Next, the table is revolved one-quarter turn and the process repeated. This description refers to setting up work parallel with the table. To set up work concentric with the bore, the tool is held sidewise in the toolholder, the procedure being similar to that described.

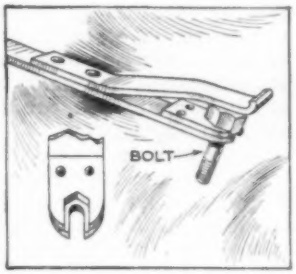
Improved Grinding Arbor

The illustration shows a grinding arbor that will prove of interest to shops where much grinding of thin tubing and similar work is done. As may be seen from the drawing, the arbor proper is pinned, or pressed, into the head that carries the driving pin. This head is recessed to take a spring and slip bushing. The other end of the arbor is threaded, and a nut, threaded to fit the arbor and counterbored to take another bushing and spring, is provided. The bushings center the work, which is held entirely by the end pressure of the nut. There is no possibility of distorting or expanding thin tubing, as generally happens when a common expansion arbor is employed.—David Ferguson, Erie, Pa.



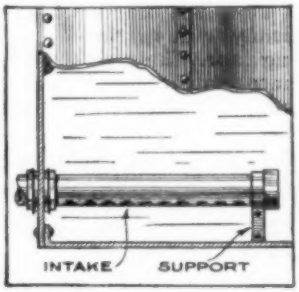
A Screw and Bolt Holder

It is very often the lot of the mechanic to be required to place small bolts and screws in places where the hand cannot be inserted to guide them, and the drawing shows a handy tool for the purpose. It is made from flat stock, with an opening cut into the end in which the bolt or screw is placed. A short length of spring steel, riveted to the tool, bears against the head of the bolt and holds it firmly while it is placed in position; when in place, an upward pull on the tool releases it from the piece.—Chas. H. Willey, W. Concord, New Hampshire.



Keeping Air Out of Suction Pipe

All pump suctions that take water from tanks at low heads have a tendency to "well in" under full load, which admits air and causes a complete loss of vacuum. It is obvious that the size of the suction pipe has a great deal to do with this. Practical experience has determined that the installation of suction pipes from 1½ to 6 in. in diameter does not require any particular thought, but that any size above this should be carefully arranged. An intake pipe of some 2 or 3 ft. in length, capped at one end and drilled with as many holes in the side as will equal the total area of the pipe, placed inside the tank or reservoir with the holes downward, as shown in the drawing, will prevent the "welling in" and consequent loss of vacuum. The effectiveness of this arrangement may be best understood when it is said that tanks of great area and with depths above the intake of not more than 12 to 16 in. have operated successfully with intake pipes from 8 to 12 in. in diameter.—L. H. Georger, Buffalo, N. Y.



A Low-Tension Electric Soldering Outfit

By H. H. PARKER

THE construction of an electric soldering copper, or bit, and of a step-down transformer to permit the use of the bit on a 110-volt alternating-current circuit, presents no great difficulty, and the advantages of a soldering bit that can be heated to any one of a range of five temperatures, and the heat of which may be so easily controlled, are so obvious as to need no explanation.

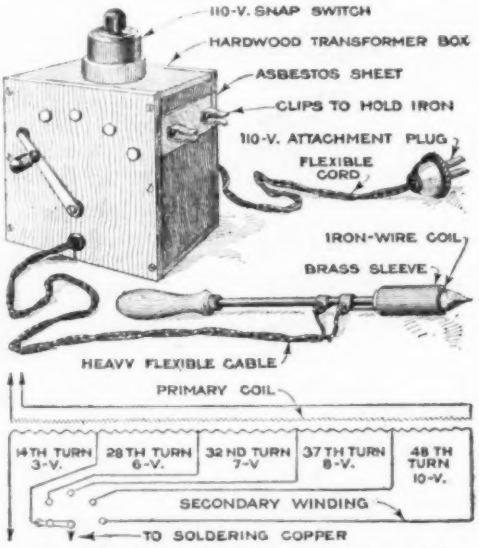
For a transformer of 200-watt capacity, the core material should be silicon steel or transformer iron, .017 in. thick, if obtainable. If it is not, "stove" iron, as thin as possible, or even the sheet iron used for making "tin" cans, if untinned, may be used. The material is cut into strips, 1 in. wide, half of the number of strips used being 2½ in. long, the remainder 3½ in. long.

One leg of the core is first made up, piling up enough of the 3½-in. strips to make a core 1¼ in. thick when compressed in a vise, and binding firmly with insulating tape. The alternate strips composing this leg overlap 1 in. at the ends, making the assembly 4½ in. long.

Wind on several layers of insulating cloth or paper and start the secondary winding; this is of No. 12 double cotton-covered wire, in two layers of 24 turns each. A loop of heavy tape is doubled over the first turn, several turns of wire laid over this, then the ends of the loop are brought up, and the winding continued. By pulling tightly on this loop, the first turn is held securely; the end turns on the two layers are similarly held. After winding on 14 turns, scrape the insulation from about ¼ in. of the last turn, and solder on a strip of copper, long enough to reach beyond the 24th turn, for a tap, then insulate the joint and tap with a wrapping of insulating paper. Lay the tap down against the core and continue the winding over it.

Solder similar taps to the 28th, 32nd, and 37th turns, which, together with the 48th, or last, turn, will give secondary voltages of 3, 6, 7, 8, and 10, with a primary voltage of 110.

When the winding is finished, insulate the coil with at least six layers of insulating cloth, then press temporary hardwood or fiber flanges on the core, to assist in winding the primary coil. This consists of 500 turns of No. 16 double cotton-covered wire, with a sheet of insulating paper between each layer. Solder a length of flexible lamp cord to the terminals of the primary coil, remove the flanges, soak the coil in shellac, bake in an oven until thoroughly dry, then wind the coil with a good quality of insulating tape or cloth. Do not use common black friction tape for any purpose except that of binding the core laminations, as its insulating properties are not to be depended upon.



A Neat and Substantial Electric Soldering Bit and Transformer: The Diagram Shows the Method of Tapping and Connecting the Secondary Winding

Assemble the remainder of the core, overlapping the alternate ends of the strips as before, drill the two holes shown, and attach a piece of light angle iron to the bottom, with two bolts. The holes must be larger than the bolts, and the latter should be wrapped with a coating of oiled or shellacked paper, to insulate them from the angle iron. The transformer is mounted in a hardwood box, to the bottom of which it is firmly fastened with screws, driven through holes drilled in the angle iron. The front of the box is preferably made of asbestos board, although wood may be used throughout, if desired; a switch arm of heavy brass or copper, with a suitable handle, and five copper contact studs, at least ½ in. in diameter, are mounted on it. The switch arm must make good contact with the studs. The studs are connected to the four taps and to the 48th turn of the secondary, as shown in the diagram, by heavy flexible leads, with the joints well soldered. The switch arm and

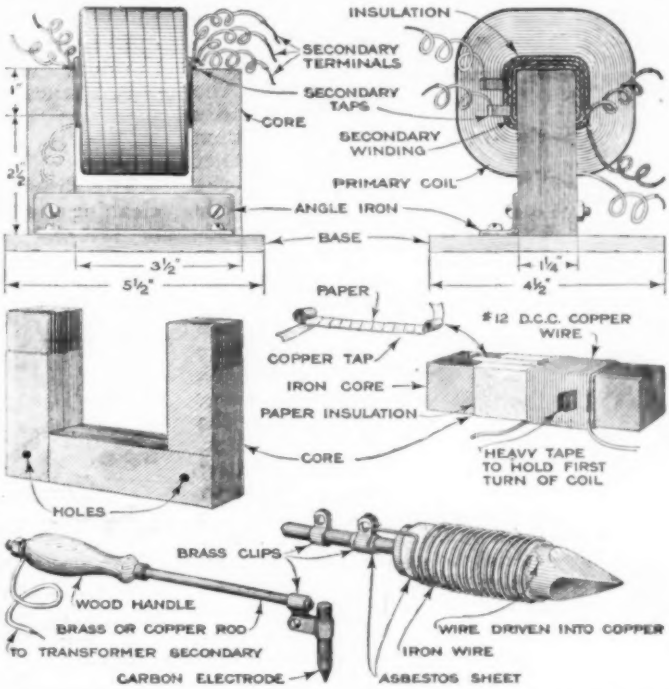
the first turn of the secondary coil are connected to two heavy binding posts, placed either inside or outside the front of the box, and the soldering copper is connected to these posts by heavy flexible cable, or very heavy lamp cord; ordinary lamp cord will overheat. On the side of the box is tacked a piece of asbestos sheet; two brass clips are attached to this, forming a convenient means of holding the tool when not in use. The snap switch shown on top of the box is for the purpose of controlling the primary current; its use is optional.

The soldering bit should be a medium-sized, plain one. Drill a small hole, the size of the wire used, just behind the point, then wrap two layers of light sheet asbestos around the bit. The wire used is iron telephone wire, with the galvanizing scraped off, and the length needed is best found by experiment, although 16 in. is usually enough. It is wound on in an open coil, after driving the end into the hole. The other end is soldered or bolted to a brass or copper clip on the bit handle; this clip is insulated from the handle by a layer of asbestos paper. A similar clip is bolted to the rod, but not insulated from it, and the cables from the low-tension binding posts bolted to the clips. Another layer of asbestos paper is wrapped over the coil, and the bit completed by pressing a short length of thin brass tubing over the asbestos.

The copper bit should heat and run solder in about 2 minutes after switching on the current. The temperature of the bit is regulated through the switch arm; to avoid heavy sparking at the studs, it may be found advisable to switch off the primary current before moving the arm.

A carbon electrode is easily made from a rod taken from a flashlight battery. It is attached to a handle by copper or brass clips in the manner shown. But one terminal of the secondary is connected to the handle, the other being fastened in contact with the work. As soon as contact is made between carbon and work, the former becomes first red, and then white-hot, the temperature generated being high enough to fuse thin sheet iron.

If it is found necessary to use the bit on either 110 or 220 volts, the primary may be wound in two sections, using two coils, of 500 turns each, of No. 20 double cotton-covered wire. The coils are connected in series for 220 volts, and in parallel for 110 volts. No change in the secondary is necessary.



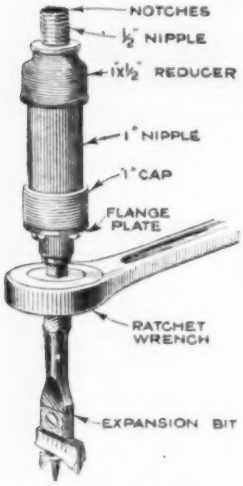
Constructional Details of the Bit and Transformer: Note the Method of Binding the End Turns of the Secondary Coil, and of Taking Off the Taps

Cord Used as a Wrench

Printing pressmen use a piece of sash cord, or similar rope, as a wrench for running down the long clamp bolts that hold the stereotype plates in place on the cylinders of rotary presses. The same idea can be applied to the removal of the dust caps of automobile tires and will be found a great timesaver, especially at service stations and garages. The operation is simple and consists in passing a bight of the cord around the bolt or valve, with one end in each hand. A sharp pull in the proper direction will unscrew the part to be removed, or tighten it.—Leo P. Cook, Marinette, Wis.

A Plumber's Ratchet Brace

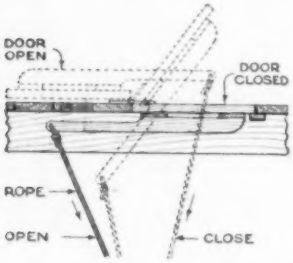
To lighten the work of boring large holes in difficult positions, the ratchet brace shown in the drawing was built from stock parts by a plumber. The body of the device is made entirely of pipe fittings. The wooden handle was removed from a 10-in. ratchet wrench, and the flange plate thus obtained was fastened to the 1-in. pipe cap with four machine screws, as shown, an adapter to take the square-shank bits used being inserted into the hole in the flange. When boring holes for pipes to pass through wall plates in a building, the plumber tacks a board between two studs, at a suitable height above the plate, so that he can use an "old man." The notched upper end of the nipple is placed against the lever. By twisting the body to the left as the ratchet handle is operated, the bit is forced into the wood. With a short bit, he can bore through floor joists, using one joist as backing for the feed screw formed by the notched nipple.—Edwin M. Love, Alhambra, Calif.



Opener for a Trapdoor

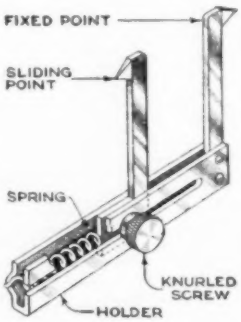
Overhead trapdoors are generally difficult to open, as they are seldom reached by a stairway, and particularly is this so in the case of doors that are placed in the roofs of barns, and other farm buildings, for the purpose of ventilation.

The device illustrated is one that has been in satisfactory use for opening and closing a trapdoor in a barn loft, and is very simple, consisting of nothing more than a wooden handle that is attached to the underside of the door. The handle is cut to the shape shown, just long enough to clear the edge of the door opening, being placed at one side so that the opening will not be obstructed. A rope through the end of the handle is used for opening and closing the door, and a slight jerk, to throw the weight of the door past the center, is all that is necessary, provided the door does not bind against the sides.—B. Francis Dashiell, Dunkirk, Md.



A Thread Cleaner

The drawing shows a handy tool for cleaning the threads of chucks, faceplates, or internal threads of machined work. When dirt or small chips of any kind become lodged in the bottom of internal threads, the result is a false fit that sometimes makes it impossible to thread two parts together, and that may spoil a piece of work that must be accurate.



The tool shown consists of a fixed and a sliding point, made from ⅛-in. stock. The fixed point is riveted inside a sheet-metal channel, while the sliding point is adjustable to any diameter within the capacity of the cleaner. The channel piece, or holder, is bent in the manner shown, with a bulge on one side to permit the insertion of a spiral spring, one end of which is hooked in a hole in the sliding point, and the other around the end of the channel. The holder is also slotted at one side to clear the shank of a thumbscrew that is threaded into the sliding point.

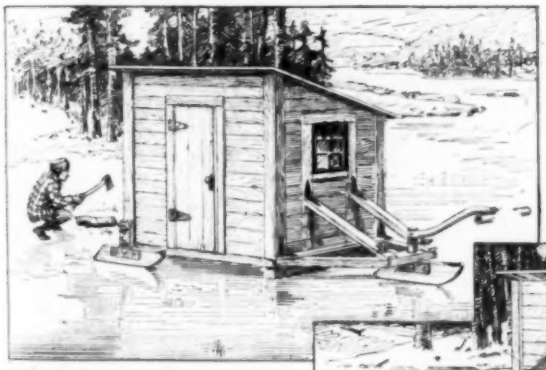
When it is desired to clean a thread, the points are started into the thread and the spring tension serves to keep them in contact against the sides. If the thread is very tightly choked, tighten the setscrew and the tool will practically cut its way through, but for ordinary cleaning, the spring will exert sufficient tension.—Harry Moore, Montreal, Can.

¶The structure of steel will show more even and finer grain than iron. By draw-filing the edge of a rolled bar, or plate, of iron and applying an acid, it will show a drawn-out fibrous structure, while steel will exhibit a structure practically free from fibrous appearance.

A Portable Fishing Shack

By P. P. AVERY

ON inland streams and lakes that are usually frozen over for a great part of the winter, the method of catching fish through holes in the ice is quite generally practiced. However, the fisherman as he sits on the ice, but indifferently protected from the chilly blasts by a rude, and, generally, ineffective windbreak, is not only uncomfortable but exposed to rheumatism and kindred ills. The drawing shows a fishing shack that can be pulled to different locations on the ice, in which the fisherman is fully protected at all times, and where he can prepare his meals, or even sleep, in warmth and comfort.

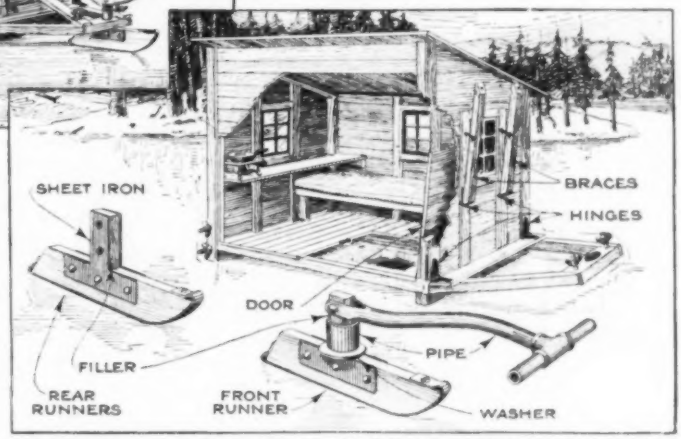


The house can be made to almost any convenient dimensions, but the self-evident fact that the smaller the building, the easier it will be to pull, should be borne in mind. If desired, the shack can be built in sections so as to be stored easily when not in use.

All three runners are detachable and held in place with bolts and wingnuts. In many cases it is necessary that the runners be removed to prevent a strong wind from blowing the shelter along the ice. The house is raised for application of the runners by means of a lever, or an automobile jack can be carried along for this purpose.

The front runner is mounted on an outrigger, hinged to the shack, and two stout, hinged braces are used to keep it in a horizontal position when the runner is in place. By means of the handle attached to the front runner it is possible to pull the house in any direction.

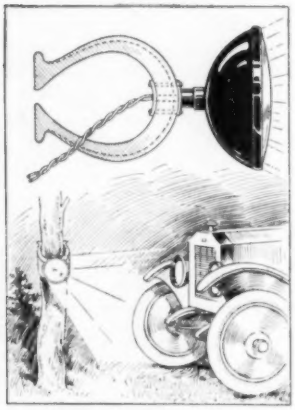
The total cost of building such a shelter is slight, and the expense is well worth while to those doing much ice fishing. The warmth of the building can be increased greatly, without an undue increase in weight, by using any one of various kinds of wallboard over the studding. Inside, the fisherman is provided with food, shelter, and warmth, and can remain on "location" for several days if he so desires. It may be found necessary to move the shack a distance of a foot or two every five or six hours, as otherwise the runners might easily freeze to the ice.



Portable House and Shelter for the Ice Fisherman, That can be Towed to Any Location on the Ice: Comfortably Housed and Protected from Wind and Cold, with Food, Shelter, and Warmth, the Fisherman can Remain on the Ice for Several Days

Holder for Trouble Lamp

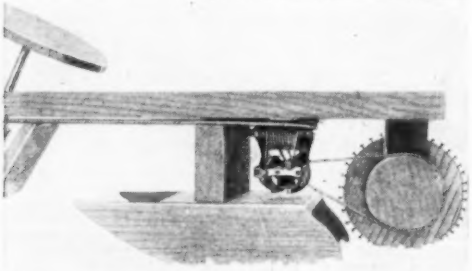
A convenient trouble-lamp holder, that can be slipped around a small tree or over the tire of the car, is made from a section of an old casing, about 4 in. long. A hole is cut through the center of the casing section, and a dash-type socket inserted and secured by means of rivets, to a metal plate on the inner surface, as illustrated in the detail. The socket is connected to a suitable length of cord, fitted with a plug, and the addition of a light bulb makes it ready for use. The lamp may be improved by soldering the reflector and lens from a bicycle searchlight over the socket.



When in trouble, simply spread the beads of the tire and allow it to close around anything that is not too large for it to grip, and the light will be held in the same position as long as desired.—L. B. Robbins, Claremont, Calif.

Electric-Lighting Plant for Sled

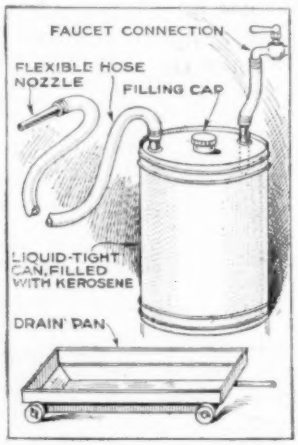
An electric-lighting plant was installed on a coasting sled to give a brightly lighted roadway for the enjoyment of night coasting. A small six-volt generator was secured under the rear end of the sled and was driven by a spiked wheel in contact with the surface of the snow. The drivewheel should be of a diameter that will fit nicely between the sled top and the snow surface, and can be cut from a piece of seasoned 1-in. stock with a compass saw. Several 10-penny nails are driven, to within ¼ in. of the heads, into the edge of the wheel to obtain traction. The drivewheel is supported by an axle, at the opposite end of which is fastened a wooden drive pulley, 6 in. in diameter. The pulley on the dynamo shaft is placed in line with the drive pulley, and a piece of heavy fishline is used for a belt. The terminals of the generator are connected to a small six-volt electric lamp attached to the front of the sled. Naturally the light burns only when the sled is running.—F. E. Brimmer, Cazenovia, N. Y.



For the Enjoyment of Night Coasting. This Sled was Fitted with a Small Generator, Driven by a Spiked Wheel Fastened by a Bracket to the Rear of the Sled

Kerosene Cleaner for Use with Hydrant

Kerosene is an excellent cleaning medium for dirty automobile engines and transmissions; the most effective method of using it is to apply it to the surface to be cleaned in a fine spray or stream, as the jet will cut the greasy dirt and oil down to the metal.



A method of applying kerosene under pressure without pumps or extra effort consists in connecting a tight can filled with kerosene to any faucet or hydrant by a rubber hose; this will give a pressure of about 40 to 50 lb., which is as much as is needed to make an effective cleaner. There is no need of separating the water from the oil, as the kerosene, being much lighter than the water, will always be at the top of the can and will consequently be forced out through the hose until the supply is exhausted. To prevent waste of the kerosene, a large flat tray or pan, with rollers attached for convenience in placing it under the car, should be used. The dirt that is caught should be allowed to settle; the oil may be used over again indefinitely.—G. A. Luers, Washington, District of Columbia.

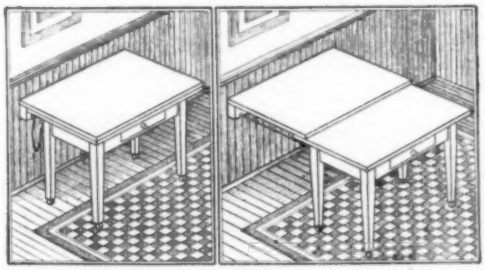
Cleaning a Fountain Pen

Lack of use and inks that gum are the frequent and most common causes of clogging fountain pens, and, of course, the only method of restoring them to satisfactory service consists in removing the hardened or gummed ink. In such cases, fill the pen with warm water and grasp it firmly, with the point away from the body. Raise the hand straight above the head, and, with a quick, sweeping motion, bring it downward almost to the floor. The centrifugal force will usually be sufficient to force the water out through the pen with such velocity that some of the dried ink is washed out. The operation is repeated until the obstruction is removed and the pen entirely cleaned. With self-filling pens, the sweeping motion is not necessary, as the water, held in the rubber sack, may be forced out through the pen, by raising the filling lever, or depressing the filling "button," according to whichever is fitted.—Barney R. Cole, Opp, Ala.

Extension Table for the Kitchen

The table shown in the drawing is very convenient in a small kitchen, where, although an ordinary-sized kitchen table answers all common purposes, occasions frequently arise when a larger table is a necessity.

In the construction of an extension table of this type, an extra table top, the same size as that of the table, is fastened permanently to the wall, in such a manner that it is at all times supported by the table underneath, which is prevented



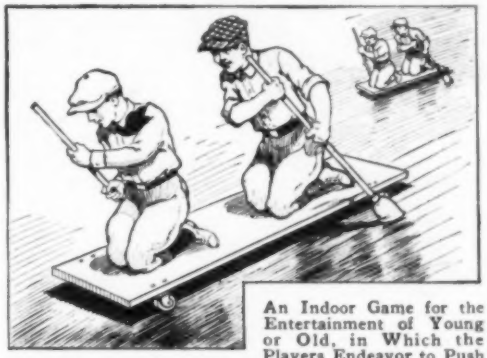
An Extension Table for the Kitchen: An Extra Table Top is Permanently Attached to the Wall and is Supported at all Times by the Table

from being pulled too far forward by a cord or wire at each end of the table.—Harold E. Benson, Boulder, Colo.

¶Vaseline or cold cream, rubbed well into the hands before doing grimy work, makes it possible to wash them clean with little effort when done.

An Entertaining Indoor Game

An original indoor game, that, as yet, remains unnamed, will provide entertainment for almost any kind of gymnastic meet, the only apparatus being at least



An Indoor Game for the Entertainment of Young or Old, in Which the Players Endeavor to Push Themselves across a Floor in a Straight Line While Kneeling on a Platform Mounted on Ball-Bearing Casters

two rolling platforms and a sufficient number of plumbers' force cups, such as used for removing obstructions from sinks and other fixtures. The platforms should be of sufficient dimensions to accommodate comfortably two persons in the position shown. A ball-bearing caster at each corner of the platform permits the arrangement to roll easily in any direction.

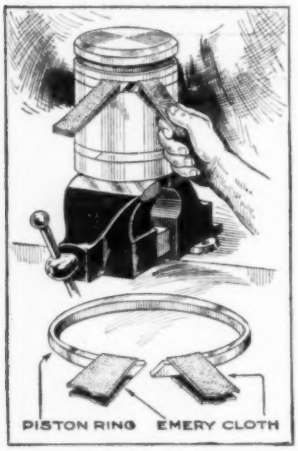
In use, two players on their knees propel themselves along the floor by means of the force cups, the object being to keep the rolling platform and its crew traveling in a straight line, something that demands a little practice and skill when the casters are kept well lubricated.—M. E. Duggan, Kenosha, Wis.

Enlarging from Wet Negatives

The method used by many press photographers for rapidly making prints and enlargements from wet negatives is as follows: After coming from the fixing bath, the negatives are given a few seconds' rinse under the tap and are then put directly, while still wet, into the enlarging lantern, and several prints are made on glossy bromide paper. The prints get the merest rinse in the hypo bath, and are then dipped into a bath of wood alcohol, where they are allowed to remain for about three minutes. After being removed, they are squeegeed onto ferrotype plates and dried with hot, dry air, obtained by using a gas stove and an electric fan. By these means, photographs can be supplied in about one-half hour.

Cloth Strips Remove Piston Rings

A simpler method for the removal of piston rings than that illustrated could hardly be devised, as the rings can be taken off or replaced in a second. Two strips of emery cloth, about 4 in. wide and 8 in. long, are torn off; these are doubled and one strip slipped under each end of the ring. By pulling on the cloth strips in opposite directions, as indicated in the drawing, the ring will immediately be opened so that it can easily be lifted off the piston.



A Window Greenhouse

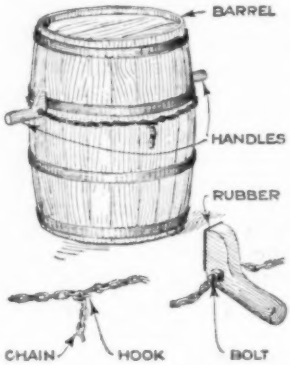
The drawing shows a simple window greenhouse that can be easily erected from ordinary window sash, assembled, and fastened to the sill, top, and sides of the window casing. The roof is also a sash, but is hinged at the back, next to the house, so that it can be raised in fine weather. A cord attached to an angular bar, which is pivoted to the side, as indicated, is used for raising or lowering the top.

A window greenhouse should preferably be placed on the south side of the house, so as to get the full benefit of the sunlight. Shelves and brackets can be fitted inside for the accommodation of plants that have trailing or drooping habits. Sufficient heat will be furnished from the room to make the growing of hardy plants an easy matter. Among these are violets, pansies, English daisies, lettuce, parsley, radishes, and, in fact, any flower or small vegetable that can be grown in the early spring and late fall in cold frames.

If desired, the greenhouse may be made so that it can be taken apart and the various parts stored away during the summer.

Detachable Handles for Barrels

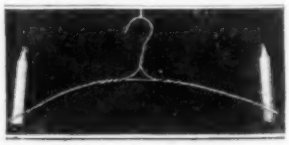
Where barrels and kegs that must be kept in an upright position are to be handled, the detachable handles illustrated simplify the difficult matter of getting a convenient hold on the barrels when handled in the usual manner.



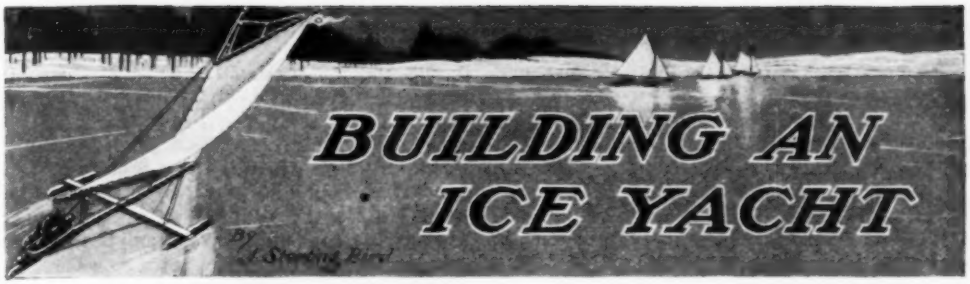
Two rubber-faced hardwood handles of the shape shown in the drawing are provided, and a suitable length of ¼-in. link chain is fastened to each side of both handles. On the ends of two of the chains grab hooks are provided that will hook into any link of the chain. The handles are placed just slightly above the bilge and the chains adjusted to the proper length. As the handles are lifted the action clamps them to the sides of the barrel.

Candelabrum Made from Coat Hanger

In camp, in a spare room, or elsewhere, it is sometimes desired to place a pair of lighted candles so that they will not come into contact with anything inflammable, and without a candlestick this is usually thought impossible.



The photograph shows a method by means of which two candles can be held in a wire coat hanger, suspended from the ceiling, and thus swung clear of anything likely to catch fire. The rounded ends of the hanger are squeezed together to hold the candles tightly and as the candles melt, the softened wax will run down and harden around the bottom, making them still more secure in the holder.—L. B. Robbins, Harwich, Mass.

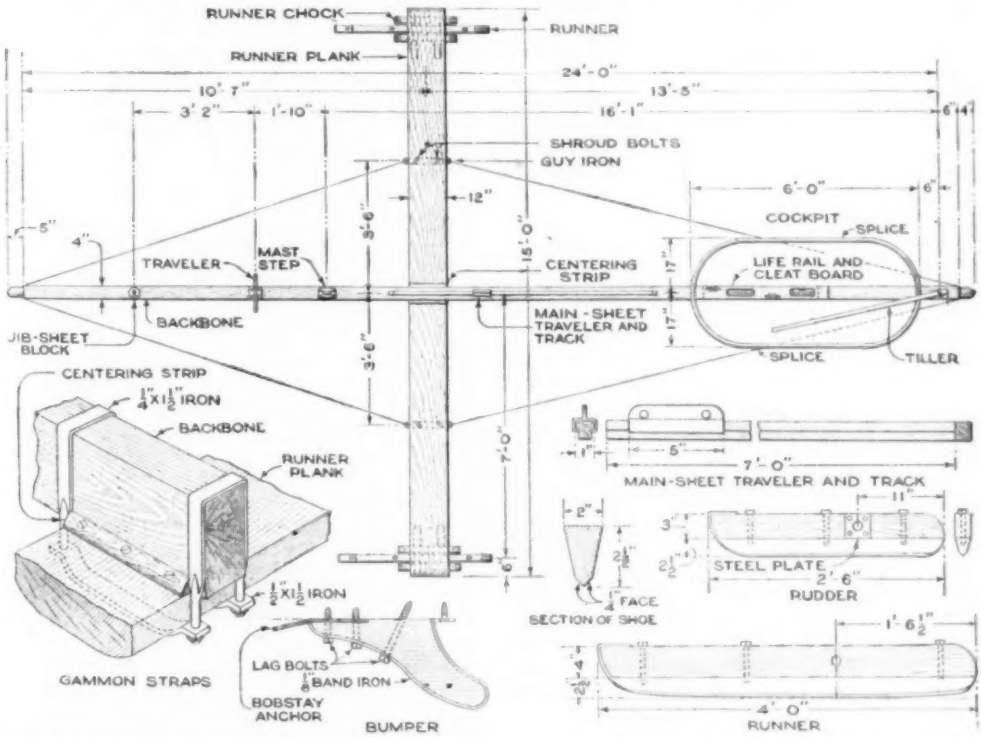


Part I—Hull Construction

ALTHOUGH the northern part of this country is blessed with innumerable lakes and streams, where that king of winter sports, ice yachting, should be enjoyed, comparatively little definite is known of the construction of fast, easily handled craft, except around such ice-yachting centers as the Hudson and Shrewsbury rivers, Orange Lake, and some mid-western lakes.

From the number of crude makeshift affairs so often seen, it is obvious that many real yachts would be built, to the lasting delight of the owners and their friends, if their design and construction were better understood, and it is for the purpose of providing this information that this article is written. The yacht herein described, while not too large to be used on a good-sized pond or small lake, is of sufficient size and speed for the most exciting races, being at the same time perfectly safe and easily handled, provided the given measurements are strictly adhered to.

The material used in the construction depends to a great extent on the available supply. In purchasing the lumber, one should always buy the driest obtainable, and the better the quality the handsomer will be the completed boat. There is no reason why one who can use carpenters' tools with ordinary skill should not be able to turn out a first-class job at a



Full Details of the Backbone, Runner Plank, and Runners: Note the Curve on the Edge of the Runner, and the Position of the Splices on the Cockpit

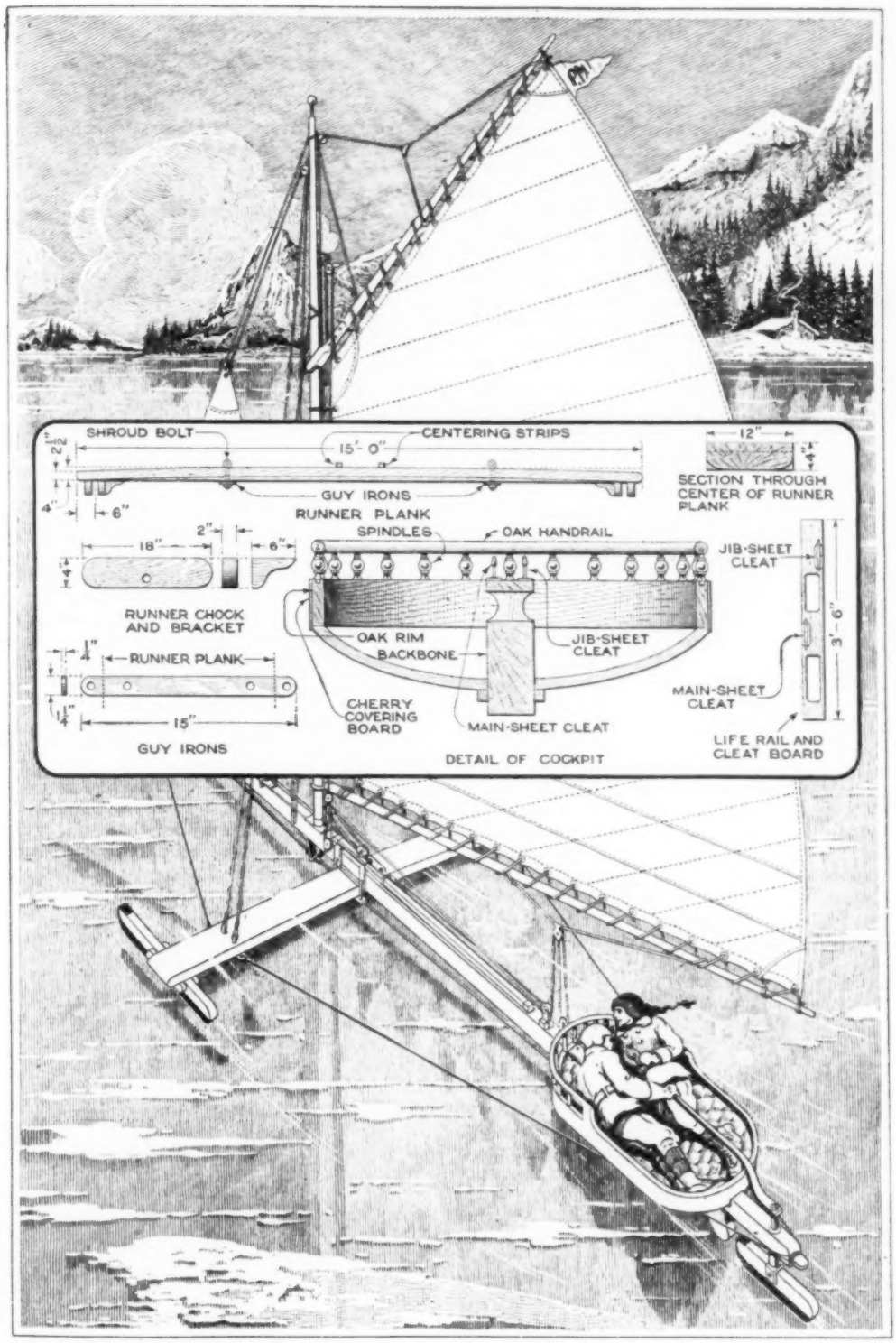
moderate outlay, if the instructions are closely followed.

For the backbone, butternut, white pine, and basswood are the most suitable woods, although cypress may also be used. The tendency of spruce to "wind" eliminates that wood from all consideration. As it is hardly possible to obtain one stick long enough for this part, allowance must be made for a splice of not less than 8 ft., and longer than this if possible. This splice should be made with one long, straight cut, without notches of any sort, as the notches weaken the timber. Only the best grade of pot glue should be used, and the joint thoroughly fastened with ½-in. lag bolts, put in from the bottom, with large washers under the heads. When spliced, the stick should measure 4 by 8 in. by 25¼ ft. It is left straight on the underside throughout its entire length and of full width, but the top of the bowsprit is tapered in a curve, beginning at the mast, down to the shoulder where the eyebolt for the forestay goes through; here it is made 4 in. thick, and from a point 2 ft. aft of the runner plank another curved taper should run to the stern shoulder, where it is 6 in. thick. All four corners on the bowsprit are rounded, and after the cockpit is in position, the after part of the backbone should be slightly rounded all the way to the stern. The tip of the bowsprit is rounded for a distance of 5 in., to receive the guys and bobstay, and the stern for a distance of 4 in., as shown in the deck plan. To insure an accurate rudderpost hole, it is bored halfway through from the top, and finished from the bottom. The whole backbone should then be planed smooth, and finished with cabinet scraper, sandpaper, and generous quantities of elbow grease, then soused with boiled oil. This applies to every part made of wood, as the oil prevents it from turning black should the varnish be marred.

The cockpit is the only really difficult part of the whole boat to make, as the rims are made of cherry and oak, and require steaming and bending over a form, with two splices where shown. The oak rim is 4 in. wide by 1 in. thick, is finished smooth, and, after forming and splicing, is placed in position and accurately centered on the backbone. Marks are made on the under edge of the rim to correspond with the edges of the backbone, and notches, ½ in. deep and as wide as the backbone, are cut in the rim; these notches fit over the backbone, to which the cockpit is securely fastened by two large screws at each end; a heavy iron strap, bent in the shape of an "L," is screwed to both the backbone and the inside of the cockpit rim at each end.

The bottom can either be made of ½-in. whitewood, in one piece, or of oak strips, 1 in. wide, with ¼-in. spaces left between them. Strips are better, as the spaces permit snow and water to pass through so that no ice can form. The bottom is screwed to the underside of the oak rim, shaped to the form shown, and reinforced by three strips of flat iron. The cherry covering board extends just below the joint of the bottom and rim, is spliced on the side opposite to the splice in the oak, and thoroughly screwed to the rim. All screw heads are sunk in deeply and wood-plugged. The handrail is of oak, on apple or maple spindles, and the life rail and cleat board are of 1-in. oak, the same width as the backbone, with the forward end screwed to the cockpit rim and the after end raised level on an oak block.

Butternut, white pine, basswood, and ash are the most suitable woods from which to make the runner plank, although cypress has also given excellent satisfaction. If ash is used, the finished plank should be ½ in. thinner than the softer woods. The rough plank should measure 16 ft. long by a full 4 by 12-in. section. As in the backbone, the underside is planed perfectly straight; the center is then marked with pencil, and from this all measurements are taken. A thickness of 2½ in., measured from the under edge, is marked at each end; a long, thin batten is sprung from these marks to the top edge at the center, and a line drawn to mark the curve to which the plank is finished. The four runner chocks and four brackets are made in pairs from 2-in. oak, or maple, of best quality. Lay off and mark the position of the inner starboard (right-hand, looking forward) chock, referring to the deck plan; square the chock very accurately, and bolt with four ½-in. carriage bolts, after sinking the chock into the runner plank ¼ in. This prevents the runners from becoming twisted out of true, and applies to all four chocks, as no other part of the boat is subject to such a terrific strain. All bolts should have washers under the head as well as under the nut. Using very large screws, one pair of brackets is fastened to the chock, then to the plank. Assuming that the runners are finished, mark one with an "S," indicating that it is always to be used on the starboard side. Place it in position with built-up cardboard, 1 in. thick, between it and the



The General Construction of an All-Around Ice Yacht of the Hudson-River Type is Shown in This Illustration. If Made According to the Instructions Given, This Yacht will Prove Not Only Fast Enough for Racing, but Very Easily Handled and Safe

chock; put the outer chock in position, then put the runner bolt through all three, tightening the nut with the fingers. This will give the position in which the outer chock is to be bolted, with sufficient allowance of space to insure free play for the runner. Cut an "A" with a chisel on the rear edge of the plank at the center, corresponding with the heel of the runner, indicating that this is the after edge. Mark the position of the inner chock on the port (left-hand) side, and bolt with one bolt only, without sinking the chock into the plank, and place the runner, cardboard, and the outer chock in place, as on the starboard side. Cut a 2-in. notch in the edge of a board equal in length to the runner plank, place it over the heel of the starboard runner, and make a slight mark where it rests on the heel of the port runner. Shift the plank to the forward end of the runners, to find if the running edges are parallel. Repeat this, shifting the port runner and chock until the running edges prove absolutely parallel, for upon their accuracy, more than on any other one thing, depends the sailing qualities of the boat. Sink in and secure the remaining chocks and brackets permanently, and remove the cardboard strips. Saw off and round the ends of the plank, as shown, and from a point opposite the inner ends of the chock brackets, spring another curve parallel with the top of the plank, and chamfer off the under edge, giving the plank a curved appearance. Strips of quarter-round hardwood are then screwed across the center in such a position that the backbone will always rest across the center of the plank.

Cast iron of the best grade is the only material which may be used for runner shoes of an ice yacht, therefore a wooden pattern of the exact size and shape of the finished shoe must be made, from which to have the shoes cast, and one for the rudder also. Although the drawings show the runners in detail, a description of the shoe is necessary. The running edge is a true right angle, and must be kept so in order to get the utmost speed out of the boat; the faces of the right angle are ¼ in. wide. The upper face must be trued in a planing machine and then drilled and tapped for capscrews. As a majority of foundries have a machine shop in connection with them, this should not be an expensive piece of work. The oak or maple top must be perfectly fitted and bedded to the shoe, and the joint made with white lead. The capscrews are ⅜ in., with washers under the heads, and are drawn up very tight. The bolt just aft of the runner-bolt hole is countersunk to clear the runner plank. The runners must be filed with the greatest possible accuracy by the following method: Place one in the vise, and, using a wooden straightedge as a guide, file the running edge to a perfect curve, with the point beneath the bolt hole left untouched and the toe and heel filed down 3/16 in. The straightedge should rock back and forth smoothly. File the faces back to a sharp right angle and finish with a carborundum stone. The runner-bolt holes are bushed with brass pipe of sufficient diameter to take a ½-in. bolt freely. These bolts have square heads, sunk into the chock ¼ in. to prevent turning, and are 8 in. long, with cotter pins outside the washers and nuts. A box, or crate, to hold and protect the runners when not in use, should be made, as any slight damage to the running edge may mean a long job of filing. In use, the runners should always remain on the ice overnight, to prevent rusting, and the edges kept in perfect and sharp condition for racing.

A hardwood bumper, made from 2-in. stuff and bound with flat iron, screwed on, is placed just forward of the rudder. It will be necessary to take measurements for this part with the rudder in position. The bobstay anchor is of ¼ by 1¼-in. flat iron, with holes drilled for lagscrews and for attaching a turnbuckle.

The track for the main-sheet traveler is made of any close-grained hardwood, in two pieces, screwed to the backbone, as shown, with the forward part removable, to allow the gammon straps to be placed in position. It should be well oiled, and only the top varnished. If it is varnished all over, the traveler will stick. The traveler must be made of brass or bronze.

As soon as the oil is thoroughly dried, go over the whole lightly with fine sandpaper and apply two or three coats of the best spar varnish obtainable, rubbing lightly between coats. All metal work not of brass should be painted with aluminum paint. This completes the hull woodwork.

A Cheap Floor Wax

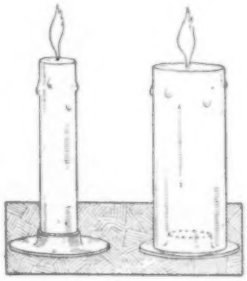
A cheap wax for ballroom floors may be made by shaving 4 oz. each of paraffin and spermaceti wax, and mixing thoroughly with 8 oz. of talcum powder. The waxes should be shaved as finely as possible, mixed with the talcum, and passed through a fine sieve.

Trimming Wet Prints

To trim wet photographic prints without pulling or tearing the edges, thoroughly wet a piece of common wrapping paper, and spread it evenly and smoothly over the surface of a piece of glass as large as the print. Lay the print on the wet wrapping paper, and, using a brass-edged ruler and a sharp knife, trim the print as desired.

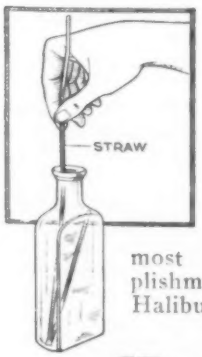
Film Spools Make Good Candlesticks

Excellent stands for the camper's candles can be made from the metal flanges taken from the ends of film spools, as shown in the drawing. Small candles simply can be pushed inside the central opening in the metal flange, but as the average candle is a little larger in diameter than this opening, it will be necessary, in most cases, to insert the flange into the bottom end of the candle, as shown in the right-hand figure; this can easily be accomplished if the metal, or the end of the candle, is slightly warmed. The additional base area thus obtained makes it possible to set the candle down on almost any level surface without danger of its falling over.



Lifting a Bottle with a Straw

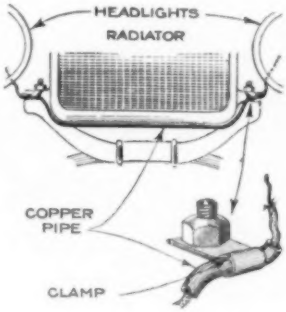
An amusing trick for those who delight to mystify their friends is to challenge them to lift a bottle with a straw. As the illustration shows, it is absurdly simple when one knows how, the straw being bent, and one end caught under the shoulder of the bottle; but to those not in the secret, it will seem almost impossible of accomplishment. — J. McCormack, Haliburton, Ont.



¶The dried silk of milkweed seedpods can be used as filling material for cushions and pillows.

Protecting Headlight Wires

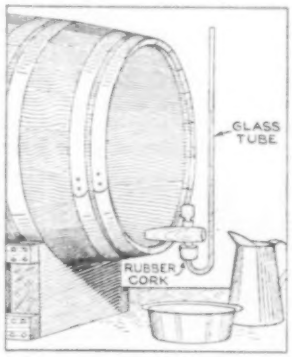
The wire that connects the headlamps of a light automobile is frequently placed loosely under the engine hood, or in a tube soldered to the back of the radiator. With either arrangement the edges of the hood, in closing, will sometimes short-circuit the wires, burning out the bulbs and leaving the driver in darkness, usually at an inconvenient time.



A method that is dependable and not subject to the trouble mentioned, consists in running the wire through a suitable length of copper tubing outside the radiator, fastening it to the car with clamps on the radiator staybolts. Thus arranged, the wires are removed from all possible contact with the edge of the hood or with moving parts of the engine.

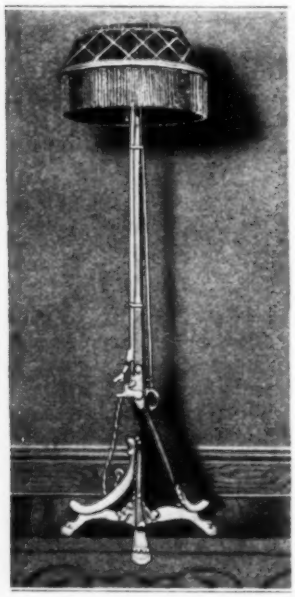
Measuring Liquid in a Barrel

The drawing shows a simple apparatus for gauging the liquid contents of a barrel or similar container. It is made from a piece of glass tubing and a large-sized rubber cork. The lower end of the tube is bent into the form of a "U," by heating the portion to be bent in a gas or alcohol flame, bending the glass when it has reached a red heat. Both ends of the tube are open, and the cork is fitted over the short end and over the spigot as illustrated. With the gauge in position, the spigot is turned on and the depth of the fluid in the barrel is indicated by its height in the tube. This makes a very handy device for keeping tab on a liquid which is being drawn off at intervals, and especially where the amount of headroom over the barrel is limited.—D. Tenney, New York, N. Y.



Floor Lamp Made from Old Musket

The attractive floor lamp shown in the photograph is made up from an old army musket of the percussion-lock type, long since obsolete, and the metal base from a familiar style of hall tree or, as it is sometimes called, a "costumer." In the absence of a base of the kind illustrated, one could easily be made in wrought iron that would embody the maker's own ideas. In this instance, the lamp cord is passed up through the barrel to a suitable cluster fixture inserted into the muzzle. The effect is completed by the addition of a suitable shade.—Perry W. Sitton, Rawlins, Wyo.



Building a Snow Lighthouse

The photograph shows a lighthouse made from snow that was a decided hit in the neighborhood when the candle placed inside of it was lighted.

The lighthouse was made by rolling three large snowballs of different diameters and placing them on top of each other, the largest one at the bottom to form the base, and the smallest at the top for the light chamber. Snow was then packed tightly at the joints to make the tapered cylinder, which was about 5 ft. high, 3 ft. in diameter at the base, and 20 in. in diameter at the top. A space was then hollowed out for the light chamber, with four openings for windows, which were protected with glass, and a candle was inserted in the center of the cavity. In order to make the candle burn, a hole was made in the top leading into the light chamber, and another hole from a point somewhat below the windows to conduct air to the candle. When the candle was lighted, the air supply through these openings allowed it to burn perfectly.—Melville S. Munro, Tufts College, Massachusetts.

Identifying Switches in the Dark Room

In the complete photographic dark room, three colored lights are used: orange, for printing; red, for developing plates, and green for panchromatic and autochrome plates. Sometimes, when one desires to turn off the light in use, the wrong switch is turned, one of the other lights turned on, and the plates or other sensitized material affected by that kind of light are fogged, if not ruined entirely. An effective method for preventing this mistake makes use of the fact that a substance of a particular color, viewed in light of its own color, appears white, and viewed in any other color, black. Thus, in the dark room, an orange card can be seen under the orange light, but disappears entirely under any other light. Take an orange-colored card and tack it to the dark-room wall over the switch that operates the orange printing light; red and green cards are similarly provided for the switches operating the lamps of their respective colors. The cards should be placed against a dark background, and the colors used should correspond as nearly as possible to the shade of light that will fall upon them, to make the arrangement satisfactory.—Charles I. Reid, Millersburg, Pa.

Leaf Mulch for Trees

In the forest, under natural conditions, dead leaves form a natural and efficient protective covering for the roots of trees; beneath are dead leaves in various stages of decomposition, above a leaf mulch. Under the somewhat artificial conditions of the home orchard, the back yard, or lawn, the leaf mulch is a protection, the importance of which is not generally appreciated. The tree roots may be very near the surface and the crown may be exposed. In the fall the leaf mulch does not form, and the cold snaps in open weather freeze the roots and crown. This is

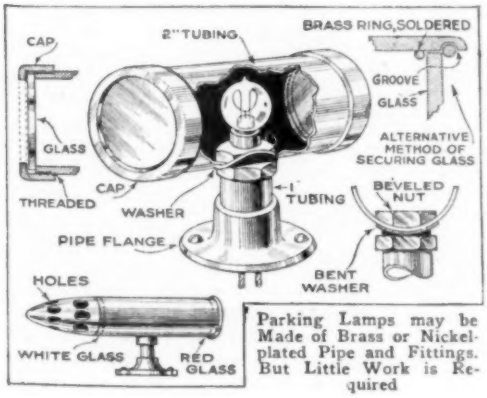
especially true of peach and plum trees, and the so-called "yellows" of peach trees is caused by winter injury to the roots and crown. The moral of all this is, that the roots and crown should be well protected in winter. If the owner has dug around the crown hunting for borers, he should take care that the earth is well replaced. Then he should use a leaf mulch. This is the very best way to dispose of the leaves that accumulate in the fall.

The ground underneath the tree should be covered as far as the branches extend. The leaves should be packed down to a depth of at least 2 in.; 6 in. is better. Cover with long straw, cornstalks, wire netting, or other material, to prevent the mulch from blowing away.—Oscar C. Place, Boulder, Colo.

An Automobile Parking Lamp

Nickelplated plumbing fixtures, or brass pipe and fittings, can be used to make a serviceable, ornamental, and efficient automobile parking lamp.

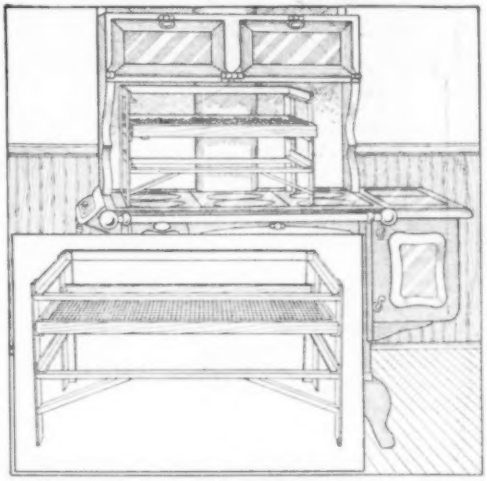
The drawing shows the constructional details of such a lamp, made from a 3-in. length of 2-in. pipe, joined at right angles to a short length of 1-in. pipe and a flange, the lamp socket being fastened to the smaller pipe with solder. The two parts are held together with locknuts, the inner one having one face beveled to conform to the curve of the pipe, while a concave washer is inserted between the outer nut and the body of the lamp. The glass can be held with a split wire ring fitting into a groove, or by a screw cap, the latter being, perhaps, the easier to use. Individual ideas may be used in making such lamps, as shown in the lower illustration; this being made by a former soldier from a one-pounder shell.—G. A. Luers, Washington, D. C.



Parking Lamps may be Made of Brass or Nickelplated Pipe and Fittings. But Little Work is Required

Fruit and Vegetable Drier

One of the most convenient methods of preserving fruits and vegetables, or for disposing of a surplus, consists in removing practically all of the water that constitutes the bulk of such products; this is frequently referred to as "dehydrating," but more commonly as "drying."



A Homemade Fruit and Vegetable Drier That can be Set on Top of the Kitchen Range or Inserted into the Oven

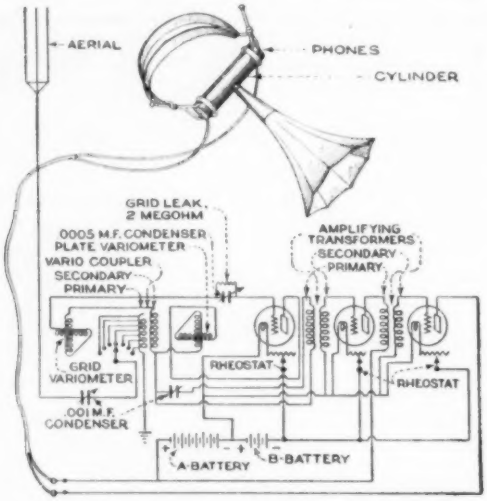
The illustration shows a compact and substantial drier that can be used either on top of the kitchen range or in the oven, where it will not greatly interfere with the usual cooking operations. Heavy galvanized sheet-iron strips are used to make a stand for holding several sliding, screen-bottomed trays. The parts of the stand are all riveted together, and the trays rest upon slides made of light angle iron, or formed by bending strips of sheet metal at right angles. The trays are made of wood, with bottoms of screen wire, and are about 1 in. deep, as the drying is completed more quickly and satisfactorily if the produce to be dried is spread out in a thin layer. It has also been proved that drying at low temperatures, although requiring a little more time, preserves a better color in the dried product.—C. R. Gains, Colfax, Ia.

Electric Iron as Arc Rheostat

For providing resistance in a stereopticon lamp, or for similar light duty, a very efficient rheostat is provided by connecting an ordinary electric iron in the circuit. Care should be taken to place the iron on a stand, or upside down.—George W. Mingie, Montreal, Que.

A Homemade Loud Talker

Every radio enthusiast wants a loud talker, but the price is prohibitive to all save comparatively few. However, with



A Loud-Speaking Arrangement for the Radio Experimenter: Such an Amplifier Costs Practically Nothing, and with It Radiophone Music and Speech are Greatly Increased in Volume

the odds and ends about the workshop it is possible to build a loud-speaking telephone that will bring in faint signals with great clearness, when the circuit illustrated is used. This particular circuit is one of the most efficient ever devised and makes use of the regenerative system with two steps of amplification. The horn used is a familiar type of phonograph horn, and the cylinder shown in the drawing is of bakelite or fiber, 7 in. long, and of a diameter suitable for the type of phones used. A hole is cut in the middle of the tube for attaching the horn. Various methods can be devised for attaching the horn, such as using sealing wax and the like, but the best method is to rivet a short piece of tubing to the cylinder to make a tight-fitting socket. The receiving set is then tuned to maximum signal strength, and the phones are clamped over the ends of the cylinder, as shown in the drawing. The vacuum tubes used in the circuit may be of any of the standard makes, a soft, or No. 1, tube for the detector, and hard, or amplifying, tubes for the two steps of amplification. The amplifying transformers are of standard make and of the audio-frequency type. The variometers and vario coupler are of the ready-to-assemble type, now commonly obtainable.—F. L. Brittin, Chicago, Ill.

Coal-Chute Shield

After the coal has been shoveled into the basement one usually finds that the woodwork adjacent to the coal chute presents an unsightly powdering of coal dust, and that the wood is even marred where lumps of coal have struck it. To prevent this, the shield described has been used with complete success.

Cut four 2 by 2-in. uprights into lengths that will reach from the ground to within 2 ft. above the top of the coal-chute door. Place two of these the width of the door apart; place the other two on the outside of these, 18 in. away. Nail sheathing boards, or, better, matched stock, all the way across the uprights for a distance of 2 ft., commencing at the top. From there on, board up only the space between the outside uprights on either side, leaving an opening in the middle.

At the height of the water sill from the ground, tack pads of a double thickness of canvas or old carpet to the back of the uprights to prevent them from chafing the paint on the house. At each side of the shield, fasten a screweye in the sill and in a corresponding place on the outside uprights fasten a hook so that the device can be held tightly against the wall. —Leo Rosasco, Indianapolis, Ind.

Carrier for Milk Bottles

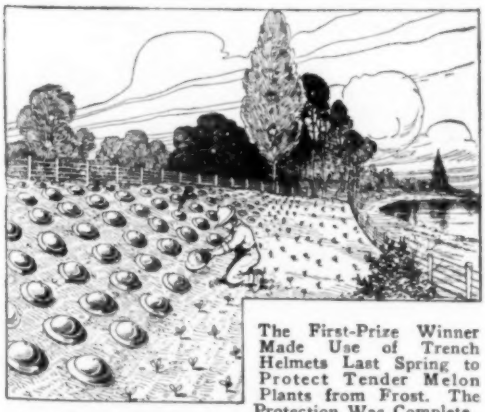
For carrying a bottle of milk so that the fingers will not be cramped by gripping it around the neck, a simple little carrier can easily be made. The wire is removed from a common bundle carrier, a longer piece substituted for it, and the ends bent down in such a way that there will be a distance of about 3 in. from the handle to the hook at the ends of the wire. Then the center of a piece of small chain is connected to one hook so that there will be sufficient chain just to fit around the neck of a milk bottle. In use, the chain is brought around the neck of the bottle and the loose ends placed over the other hook on the carrier.—L. B. Robbins, Harwich, Mass.

UTILIZING NEW STEEL TRENCH HELMETS

IN SELECTING the articles in our recently closed prize competition, on "How to Use New Trench Helmets," of which the government has several millions for sale, it has been the intention of the judges to select those that seemed most practical in use, not too difficult to make, and most likely to provide demand for the largest sale of the helmets. Many of the articles submitted were more ornamental than those selected, and as useful, but required considerable effort to make; this was considered likely to lessen the consumption of the helmets. Although not in the prize-winning class, several other ideas sufficiently meritorious are presented along with the winning ideas.

Trench Helmets Protect Plants from Frost

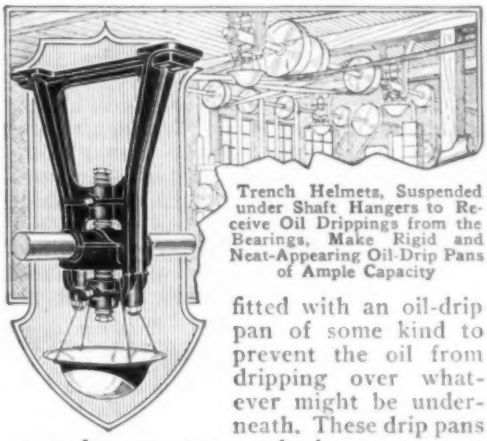
The premier prize winner is J. A. Goodall, of Mountain Home, Ida., who used several of the helmets in his garden last spring to protect early plants from frost when the temperature fell too low. The protection afforded the plants was so complete that he has taken steps to secure a sufficient number of helmets to protect his entire melon crop next spring. He intends to plant about two acres of melons, and by protecting them in the manner described, hopes to get his crop on the market about a month earlier than usual. The helmets are specially fitted for the protection of such plants as melons, squashes, and the like, which have no upright stalk. The helmet is heavy enough to remain in place during the hardest wind.



The First-Prize Winner Made Use of Trench Helmets Last Spring to Protect Tender Melon Plants from Frost. The Protection Was Complete, the Helmets Being Heavy Enough to Maintain Their Position in the Strongest Wind

Oil-Drip Pans Made from Helmets

Most countershaft and lineshaft bearings in industrial establishments must be fitted with an oil-drip pan of some kind to prevent the oil from dripping over whatever might be underneath. These drip pans are of every type and character, most of them so flimsy and of such insufficient capacity that they are little better than worthless. Evidently, the winner of the second prize, W. E. Swanson, of Weehawken, N. J., had in mind these facts when he submitted his idea, which is illustrated herewith. Four holes are drilled in the rim of the helmet and stiff wires are inserted and hooked around the shaft hanger, resulting in a singularly rigid and neat-appearing drip pan of ample capacity.

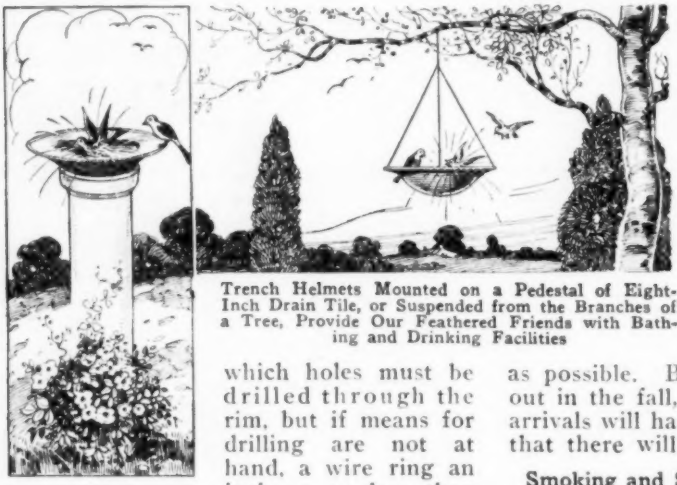


Trench Helmets, Suspended under Shaft Hangers to Receive Oil Drippings from the Bearings, Make Rigid and Neat-Appearing Oil-Drip Pans of Ample Capacity

Trench Helmets Used for Bird Baths

Truman R. Hart, winner of the third prize in the contest, lives in Ashtabula, Ohio, and his idea utilizes surplus helmets for bird baths, suspended from the branches of a tree, or mounted upon a pedestal. In the latter case, an 8-in. sec-

tion of drain tile is used for supporting the water-filled helmet. If the bath is to be suspended from a tree, as illustrated, three or four wires will be needed, for

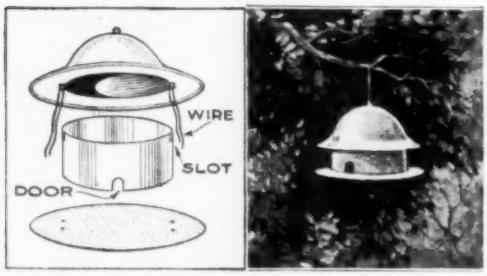


Trench Helmets Mounted on a Pedestal of Eight-Inch Drain Tile, or Suspended from the Branches of a Tree, Provide Our Feathered Friends with Bathing and Drinking Facilities

which holes must be drilled through the rim, but if means for drilling are not at hand, a wire ring an inch or so less than the diameter of the helmet, may be placed about it, and the suspension wires hooked or soldered to the ring. This idea, as well as the one described as the winner of the fourth prize, can be utilized by schoolboys and others as a means of making extra money, by making and selling bird baths and houses of the type described. A small wooden block should be placed in the bottom of the bath, so that the birds may perch upon it.

Bird Houses Made from Helmets

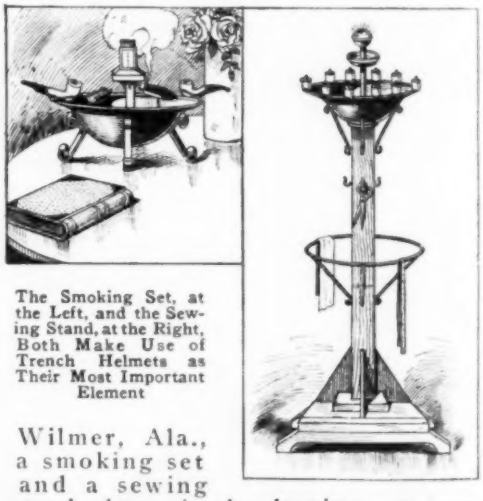
The fourth prize was won by the idea submitted by Geo. A. Stephen, of Ottawa, Ill., describing the construction of a bird house, using a trench helmet, as shown in the photograph and drawing. The strap and cushion are removed from the helmet. A wire loop, or ring, is placed through the hole in the center of the crown. The base is cut from a piece of galvanized iron, upon which the outline of the helmet has been traced. A 5-in. length of 8-in. furnace pipe is placed in the helmet, and slots are cut on opposite sides so as to allow it to pass the metal strap loops. Next the arched door is cut on the lower edge of the piping. If intended as a wren house, a hole the size of a quarter is large enough. Two 15-in. pieces of wire are placed through the strap loops and bent at the center. Four holes, two on each side, are punched through the base, and the ends of the wire are inserted, being brought together and twisted or tied as neatly as possible. Bird houses should be put out in the fall, in order that the earliest arrivals will have accommodations and so that there will be no odor of paint left.



A Trench Helmet Utilized to Make an Attractive and Substantial House for Wrens and Other Small Birds

Smoking and Sewing Sets from Helmets

Coming from outdoors into the home, the two ideas submitted by Geo. H. Cappel,



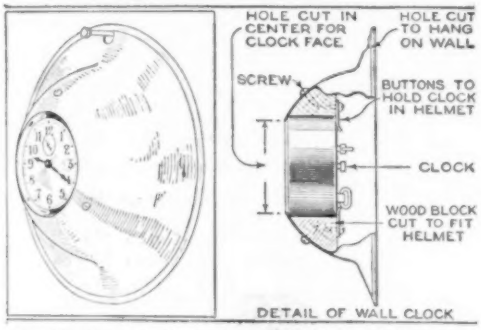
The Smoking Set, at the Left, and the Sewing Stand, at the Right, Both Make Use of Trench Helmets as Their Most Important Element

Wilmer, Ala., a smoking set and a sewing stand, shown in the drawings, are very useful. In the former, the helmet is supported by four wrought-iron legs, riveted to the sides, a matchbox holder being riveted to the center of the crown, and appropriate holders for pipes and cigar to the rim. The sewing stand is built somewhat along the same lines, with the difference that the helmet is supported on a wooden pedestal. Rising from the center of the helmet is an upright piece that holds a pincushion and tray for pins. Short lengths of rod are riveted around

the outside of the rim as holders for the different colors and sizes of thread.

A Trench-Helmet Clock

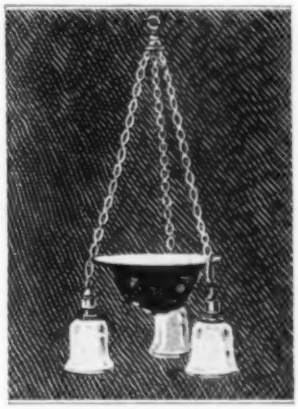
Properly finished, the trench-helmet-clock idea submitted by V. N. Perry, Buffalo, N. Y., makes an effective and attractive wall ornament, although considerable work is necessary to cut the hole through the crown, unless a lathe or milling machine can be used. After a hole of a diameter sufficient to accommodate the clock is obtained, a wooden block is made to fit inside the helmet and fastened with two or three screws. A hole is bored through the block large enough to allow the clock to slip in easily, where it is held in position with metal buttons.



An Effective and Attractive Wall Clock Made from a Trench Helmet: A Hole is Cut in the Crown and a Block of Wood, Bored to Fit the Clock Used, Screwed to the Inside of the Helmet

A Trench-Helmet Lighting Fixture

Fred C. Bass, Fernie, B. C., did his stretch in the army and retains his "Carnegie derby" as a souvenir of his experiences, by converting it into the attractive electric-lighting fixture shown in the photograph. The outside of the helmet was polished as smoothly as possible and about 40 cap, collar, and shoulder devices, representing the many regiments of the American and Canadian forces, were soldered all over the crown. A row of large-sized coat buttons was soldered around the outer rim of the helmet. The outside was given a coat of gold bronze, and the inside was treated with white enamel to reflect the light rays from the electric lamp concealed within the helmet. A canopy and metal chains to suspend the fixture from the ceiling, together with three sockets and shades that are supported by the lower ends of the chains, complete a very fine piece of work.



Flattening Warped Phonograph Records

Phonograph disk records are sometimes warped when bought, or become warped afterward, with the result that the undulations of the tone arm cause an unpleasant grating noise or excessive wear on the record, and often, in extreme cases, a noticeable rise and fall in tone.

To flatten the record and correct these conditions, place a sheet of plate glass upon the record and expose it to the sun. The glass should be large enough to cover the record completely. If the glass seems too light, place small weights about the edge so that the pressure will flatten the record when the sun's warmth begins to soften the composition. The length of time needed to expose and flatten a record will vary, of course, with the condition of the record and the heat of the sun. However, it should not be exposed too long. If done carefully, the sound grooves will not be damaged.—C. M. Adams, Milford, Ohio.

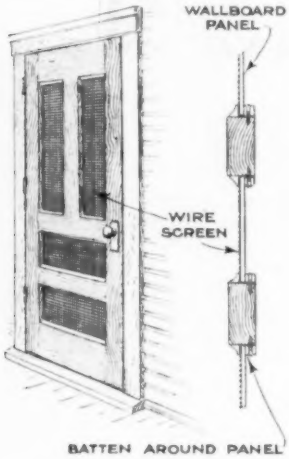
An Auto on Runners

A combination of automobile and sleigh, for traveling on hard-packed snow and ice, is made by the addition of a set of runners to the front wheels of the car, as shown in the photograph.

The runners are bent from hardwood of suitable thickness and of the same width as the diameter of the tires. Triangular blocks, in front of and behind the wheels, prevent any movement when the runners are clamped in place by means of the bolts shown. Skid chains are necessary on the rear wheels in order to obtain the maximum amount of tractive effort.—Dick Greenwoll, Prince Rupert, B. C.

Storm Door from Screen Door

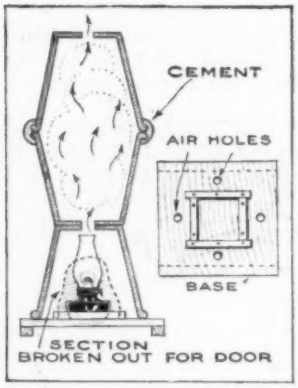
Instead of taking the screen doors down for the winter, the wire screen can be given a coat of paint to protect it from rust and used to make a cheap storm door.



The drawing shows how the storm door is made, by using wallboard panels that are held against the screen wire by battens, or strips fastened to the woodwork of the door. The wallboard should be painted on both sides to protect it from moisture. Before adding the panels to the door it would be well to add an extra pair of hinges to bear the additional weight of the wallboard.—J. Arthur Stevens, East Boothbay, Me.

Small Heater from Flowerpots

A small heater that is quite effective for removing the chill from a room and which may even be used, with proper precautions to prevent fire, to keep the temperature of a small garage from falling too low, is shown in the illustration.



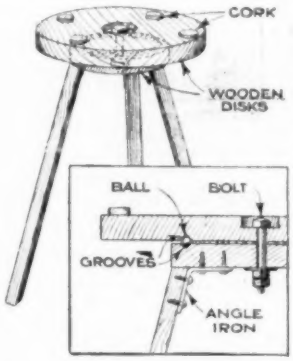
A square board is provided with cleats to hold a kerosene lamp on its center. Several holes are drilled around the center to admit air, without which the lamp cannot burn; the base is supported above the floor by strips nailed on opposite sides. Two large clay flowerpots are placed top to top, and the joint is closed with cement or plaster of Paris. A third flowerpot is used as a lamp housing, and a section can be broken away in it to permit regulation of the lamp. The assembled heater appears as shown in the drawing.

Asbestos Protects Auto Hood

Owing to the high degree of heat to which an automobile-engine hood is subjected, the finish deteriorates rapidly, and in some cases, the unequal contraction and expansion of the metal and the paint cause the latter to chip and flake. This trouble can largely be prevented by lining the hood with asbestos paper, using shellac to hold the paper to the metal. The hood is opened up as flat as possible and one or more thicknesses of paper pasted onto the underside.—Dale R. Van Horn, Lincoln, Neb.

A Revolving Carom-Board Stand

Players of carom, who are familiar with the disadvantages of moving from one position to another and turning the board around so as to enable them to make a good shot, will appreciate the points of the revolving stand illustrated.



The drawing is practically self-explanatory and shows a three-legged stand, in the top of which is a circular V-shaped groove, that serves as a ball race for a number of hardened steel balls. The larger disk that rests upon the balls revolves about a bolt passing through its center and the top of the stand. Holes are drilled near the edge of the revolving disk and corks inserted, the friction of which prevents the board from being easily disarranged.—Lester A. Hitchcock, Kewanee, Ill.

To Render Paper Translucent

To make paper translucent, and give it the appearance of parchment for making lamp shades, make up a mixture of paraffin oil, turpentine, and raw linseed oil. This is applied to both sides of the paper with a tuft of cotton.—Geo. L. Emerson, Chicago, Ill.

PRIZE OFFERS

PULITZER PRIZES AND SCHOLARSHIPS TO BE AWARDED ANNUALLY

Prizes and scholarships established in Columbia University by the will of the late Joseph Pulitzer, and to be known as the "Pulitzer Prizes," are to be awarded annually for various kinds of literary work, as follows: In journalism, $1,000 for the best paper suggesting improvements of the School of Journalism; a gold medal, costing $500, for the most disinterested and meritorious public service rendered by any American newspaper during the preceding year; $500 for the best editorial article written during the year; $1,000 for the best example of reporter's work during the year; in general literature: $1,000 for the American novel, published during the year, which shall best represent the wholesome atmosphere of American life; $1,000 for the original play, performed in New York, which shall best represent the educational value and power of the stage in raising the standard of good morals, taste, and manners; $2,000 for the best book of the year upon the history of the United States, and $1,000 for the best American biography teaching unselfish services to the people, illustrated by an eminent example, excluding, as too obvious, the names of George Washington and Abraham Lincoln. This year, for the first time, a prize of $500 is offered for the best volume of verse published during the year, by an American author.

Besides these prizes, traveling scholarships, having a value of $1,500 each, will be awarded annually, as follows: three to graduates of the School of Journalism who shall have passed their examinations with the highest honors, and are otherwise most deserving; one to the student of music in America who may be deemed the most talented and deserving; and one to a similar art student. These traveling scholarships are to enable the recipients to travel in Europe, and continue their work there.

Full particulars can be obtained by addressing the secretary of Columbia University, New York, who will furnish application forms.

CONTEST IN WHICH PRIZES ARE OFFERED FOR BEST CANADIAN NOVEL AND STORY

Similar to many such contests in this country, Canada is now inaugurating a contest in which prizes are offered for the best novel, preferably concerned with life in Canada, and for the best story for Canadian boys and girls. For the former the prize is $2,500, and for the latter $500. Competitors for these prizes must be either of Canadian birth, or have resided in Canada since Jan. 1, 1920, with the intention of making a permanent residence there. No author may submit more than two books in each of these contests. The novel should be between 75,000 and 90,000 words in length, and the story for boys and girls must not exceed 60,000 words. The manuscripts must be received by June 1, 1922, and must be accompanied by a form letter which can be obtained by applying to Hodder & Stoughton, Limited, 263 Adelaide St., West, Toronto, Ontario.

WELSH PRESBYTERIANS OF PHILADELPHIA HAVE EISTEDDFODS ANNUALLY

The eisteddfod is a Welsh institution, dating back to the year 700 A. D., the object of which is to develop talent in music, literature, and art. This is done by means of friendly competition which is stimulated by the offer of prizes. The twelfth annual eisteddfod under the auspices of the Young People's Society of the Welsh Presbyterian Church will be held Jan. 2, 1922, at the Academy of Music, Philadelphia, when as many as 15 prizes will be awarded in musical contests, ranging from a first prize of $500, and a second of $150, for the best male chorus of 40 to 50 voices, to $5, $10, $15, and $20 for the best singing, piano, and violin solos. Besides the chorus and solo prizes, there are others for quartets and duets of $20, $30, and $40 each. In the line of literature, there are prizes for essays in English or Welsh. There is one prize offered for a pen and ink sketch, and another, of $20, for a design suitable for a magazine cover. In needlework there is a prize of $10 for a table cover. Competitions are open to all who purchase a ticket of admission prior to the preliminaries. All compositions and needlework, as well as the names of contestants in musical numbers, must be in the hands of the secretary by December 1, this year.

A THOUSAND PRIZES FOR BEST LETTERS DESCRIBING USES OF OIL HEATER

The manufacturers of the Perfection Oil Heater, that is said to be in use in many homes, offer $5,000 in prizes for letters describing the various ways in which this heater is used. Besides its use as an ordinary room heater, there are said to be a great many unusual ways of using the heater, such as for drying clothes indoors, or in summer camps, and it is these unusual applications of the heater that are to be the subject of the contest letters. The contest is open to everybody. Rules and all particulars can be obtained by asking for the contest folder at any store where these heaters are sold. The cash prizes offered are respectively $1,000, $500, $250, $150, and $100. Other cash prizes, together with a set of kitchen utensils in each case, are respectively $90, $75, $50, five of $25, and twelve of $10 each. Without cash there are 975 prizes of various household utensils, making 1,000 prizes in all. The contest closes Dec. 10, 1921. Address: Contest Dept., The Cleveland Metal Products Co., 7362 Platt Ave., Cleveland, Ohio.

PRIZES FOR BEST STORIES OF ADVENTURE ON NAVAL VESSELS IN THE WAR ZONE

Many thrilling adventures that have never been recounted were experienced by members of the crews of the numerous small vessels that took part in patrolling the ocean, during the late war, and in escorting troop and merchant ships through the war zone. In order to have the opportunity of telling in its columns some of these untold stories, the American Army and Navy Journal offers prizes for the best accounts of war-zone experiences of small American naval vessels. There are four prizes offered, $100, $50, $25, and $15, respectively. Contest stories must be written by participants in the adventures related. They must reach the journal by Jan. 31, 1922. Address: Army and Navy Journal, 20 Vesey St., New York City.

TEN PRIZES FOR ESSAYS ON HEREDITY AS PORTRAYED IN NEW YORK PLAY

Announcement has been made by a New Yorker, who wishes to remain anonymous, that he will award $500 in prizes for the 10 best essays on the subject of heredity, as portrayed in "The Triumph of X," a play now being performed at the Comedy Theater, in New York. The first prize will be $100, the second $80, with eight others of $40 each. The essays are not to exceed 1,000 words, and are to be sent to Edwin Markham, 201 West 108th St., New York City, who is to be the judge.

BOXING AND CRATING TRAINING COURSE AT FOREST PRODUCTS LABORATORY

On account of the eager response to the previous offer of a practical course of instruction in boxing and crating at the Forest Products Laboratory, Madison, Wis., the Forest Service of the Department of Agriculture has deemed it advisable to announce dates for three courses in addition to the November course, previously announced. The dates for all four courses are as follows: Nov. 7-12, 1921; Jan. 9-14, March 6-11, and May 1-6, 1922. The object of these courses is to demonstrate the principles that underlie proper box and crate construction, and to supply information that will be of assistance in developing containers that will deliver their contents in the most satisfactory condition at the lowest cost. The courses are

given in the most completely equipped box laboratory in the country. A coöperative fee of $100, payable to the Forest Products Laboratory, is charged to cover partially the cost of conducting the course. All correspondence should be addressed to the Director, Forest Products Laboratory, Madison, Wis.

"CONTEMPORARY VERSE" OFFERS PRIZES FOR BEST CONTRIBUTIONS OF YEAR

"Contemporary Verse" is a magazine that is published in the interests of the public and the poets, regardless of profit. It is run at a financial loss, and therefore its policy is not to pay the authors of accepted manuscripts. As an exception to this policy there are offered three sets of prizes—five of $40, five of $20, and five of $10—to the poets whose work in the magazine, during 1921, shall be deemed best by three competent judges outside the editorial staff. Address: Contemporary Verse, Logan P. O., Philadelphia.

CONTESTS PREVIOUSLY ANNOUNCED

Students of Railroad Engineering: Scholarships; announced March issue, 1920; closes Dec. 31; offered by the Southern Pacific.

Essays on the Life of Roosevelt: Scholarship prizes valued at $1,000, $750, and $500; announced August issue, 1920; closes Dec. 31; address, Woman's Roosevelt Memorial Association.

New Methods of Testing Hardness of Metals: Prize $1,000; announced October issue, 1920; closes Jan. 1, 1922; address, Institution of Mechanical Engineers, London, England.

Essays on Economics: Prizes, $1,000 and $500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to the City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Orchestral-Composition Contest: Prize $1,000; announced September issue, 1921; closes, Jan. 1, 1922; address, Carl D. Kinsey, 624 S. Michigan Ave., Chicago, Ill.

Safety-First Essays: Prizes, a trip to Washington and gold watch, a gold loving cup, a silver loving cup, and other state prizes; announced September issue, 1921; closes late in the fall; address any public-school teacher.

Essays on Cruelty of Trapping: Prizes, $100, $75, $50, and 2 special prizes, $50 and $25; announced Oct., 1921; closes Dec. 31, 1921; address, American Humane Association, Albany, N. Y.

Research Thesis by a Woman: Prize $1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lilian Welsh, Goucher College, Baltimore, Md.

Model in Clay by Students of Chicago Art Institute: Prizes, $1,000, $100, and $50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

Best Stories of Infantry Platoons in Late War: Prizes, $100, $50, $25, and $15; announced November issue, 1921; closes Dec. 31, 1921; address, Army and Navy Journal, New York City.

Cleverest Sale Story: Prizes, $200, $100, $50, $25, $15, and $10; announced November issue, 1921; closes Nov. 15, 1921; address, Indianapolis Star.

Best Short Stories: Prizes, 10 of $100 each; announced November issue, 1921; closes Dec. 31, 1921; address, True Stories Magazine, New York City.

CIRCUS DAY IN MINIATURE IN FLORIST'S WINDOW

MINIATURE villages have always been popular with young and old alike. An interesting example, recently displayed in the window of a Chicago florist, depicts circus day. The parade has just left the circus grounds, headed by the bandwagon and followed by a chariot, caged animals, elephants, camels, and giraffes. The circus itself has a main tent, sideshow, merry-go-round, Ferris wheel, and flying dutchman. The city has a population of 150 people, one inch tall, who live in electrically lighted houses and ride in modern electric railway trains. The owner states that it took him three years to make the display, wood and beaverboard being the principal materials used.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

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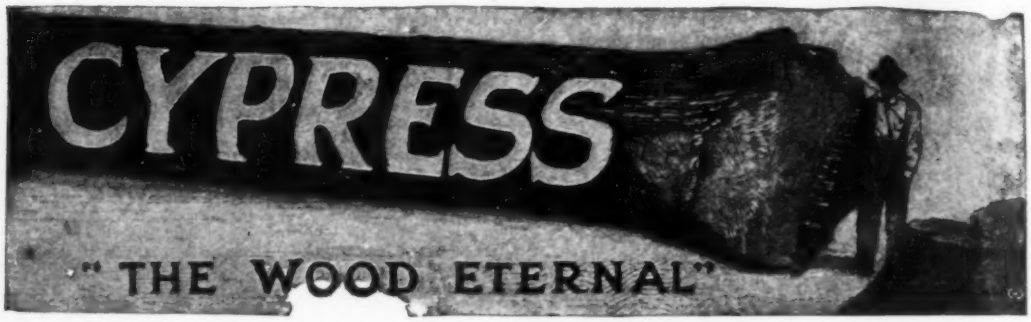
HE WHO USES CYPRESS LUMBER BUILDS BUT ONCE



SO MANY PEOPLE KNOW
so little about woods
(and their relative values—How is it with you?)

SO MANY PEOPLE THINK
that "LUMBER IS LUMBER"—(How often do YOU *specify the kind* of wood you want used by your builder?)

SO MANY PEOPLE BELIEVE
that frequent *Repair Bills* are "*Necessary Evils*"—
that we believe we are doing a public service in informing you and other intelligent people on

CYPRESS
("THE WOOD ETERNAL")

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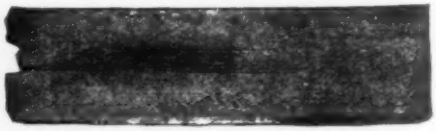
HERE IS CYPRESS *VS.* WEATHER: A photograph of a CYPRESS SHINGLE from the Austen Homestead, Staten Island, N.Y. built in 1710, and at last accounts still occupied by descendants of its original builders, with the original CYPRESS roof practically intact.

"*He who uses* CYPRESS *builds but once.*"

Below is a photograph of one of the iron connections just as dug up—most of them rusted past all usefulness.



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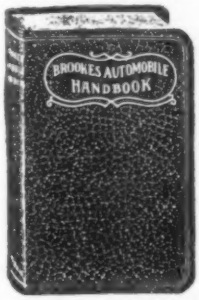

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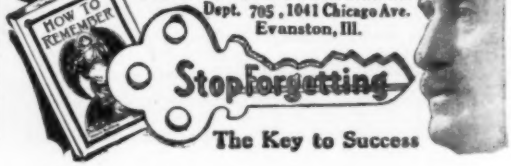

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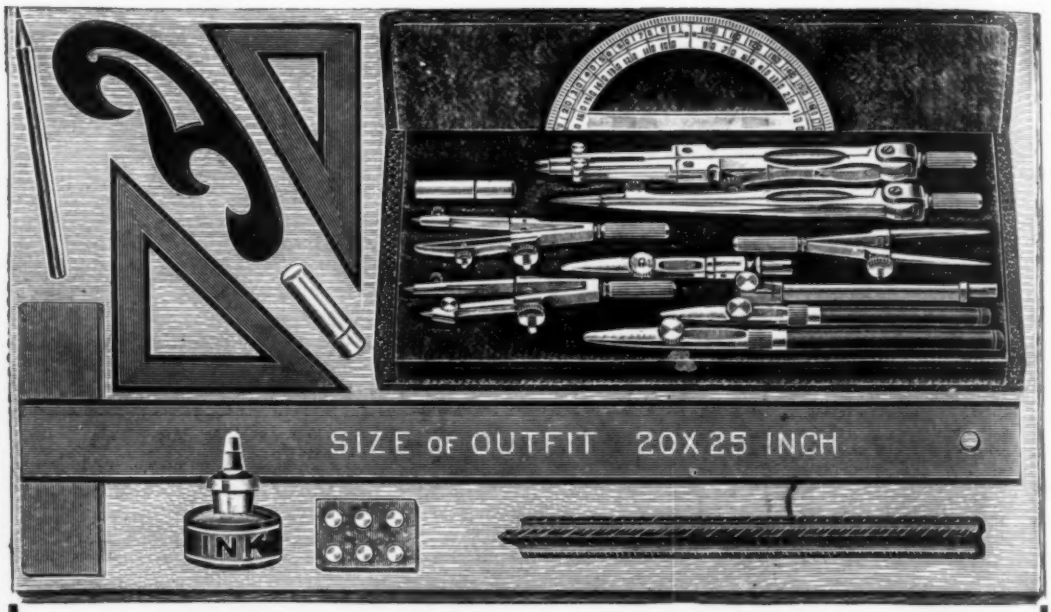

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To persons who have not previously heard of my method, this may seem a pretty bold statement. But I will gladly convince you of its accuracy by referring you to any number of my graduates in any part of the world. There isn't a State in the Union that doesn't contain many players of the piano or organ who obtained their training from me *by mail.*

Investigate by writing for my 64-page free booklet, "How to Learn Piano or Organ."

My way of teaching piano or organ is *entirely different* from all others. Out of every four hours of study one hour is spent *entirely away from the keyboard,* learning something about Harmony and The Laws of Music. This is an awful shock to most teachers of the "old school," who still think that learning piano is solely a problem of "finger gymnastics." When you *do* go to the keyboard, you accomplish *twice as much,* because you *understand what you are doing.* Within four lessons I enable you to play an interesting piece not only in the original key, but in other keys as well.

I make use of every possible scientific help—many of which are **entirely unknown** to the average teacher. My patented invention, the COLOROTONE, sweeps away playing difficulties that have troubled students for generations. By its use, Transposition—usually a "nightmare" to students—becomes easy and fascinating. With my fifth lesson I introduce another important and exclusive invention, QUINN-DEX. Quinn-Dex is a simple, hand-operated moving picture device, which enables you to see, right before your eyes, every movement of my hands at the keyboard. **You actually see the fingers move.** Instead of having to reproduce your teacher's finger movements from MEMORY—which cannot be always accurate—you have the correct models before you during every minute of practice. The COLOROTONE and QUINN-DEX save you months and years of wasted effort. They can be obtained **only from me** and there is nothing else anywhere even remotely like them.

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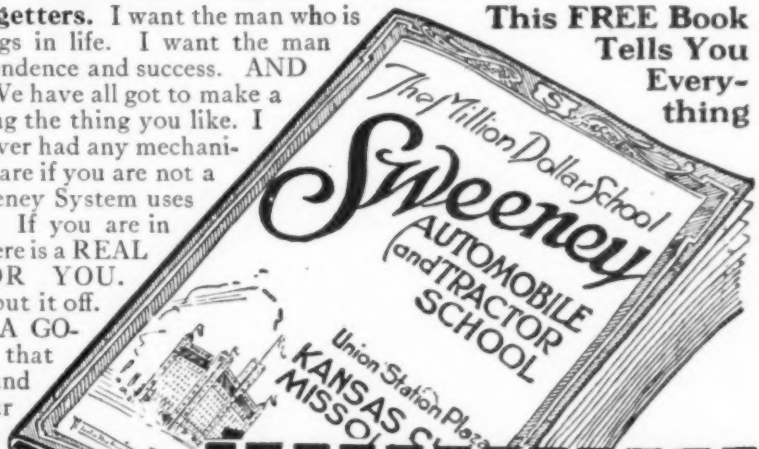

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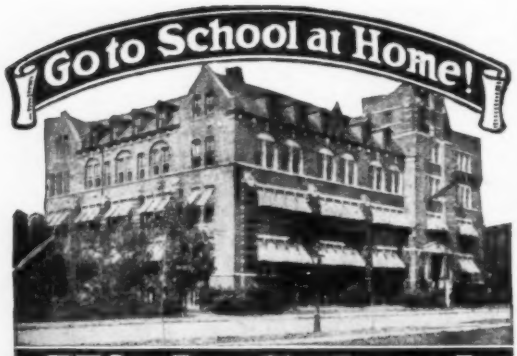

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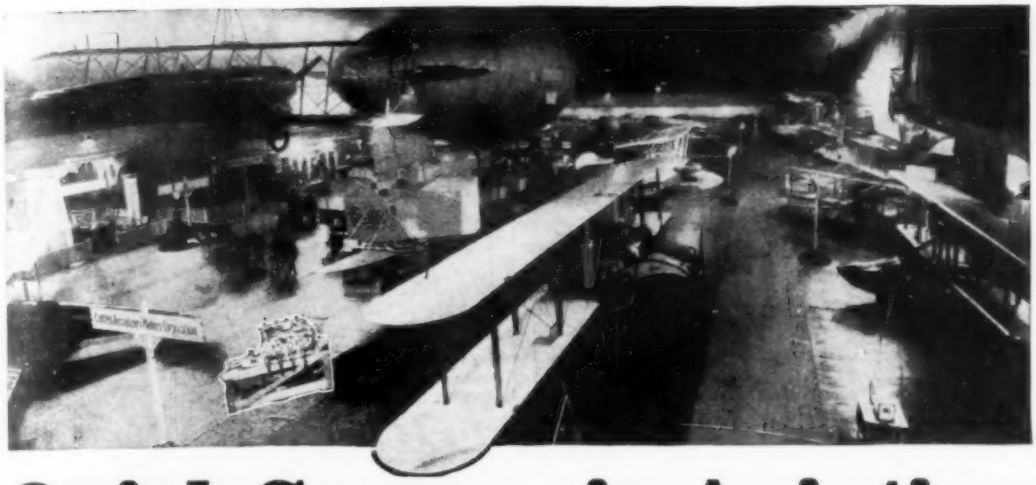

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LET'S have a little chat about getting ahead—you and I. My name is Pelton. Lots of people call me "The Man Who Makes Men Rich." I don't deny it. I've done it for thousands of people—lifted them up from poverty to riches.

I'm no genius—far from it. I'm just a plain, everyday, unassuming sort of man. I've looked black despair in the eye—had failure stalk me around and hoodoo everything I did.

But today all is different. I have money and all of the things that money will buy. I am rich also in the things that money won't buy—health, happiness and friendship.

It was a simple thing that jumped me up from poverty to riches. As I've said, I'm no genius. But I had the good fortune to know a genius. One day this man told me a "secret." He said that every wealthy man knew this "secret,"—that is why he was rich.

I used the "secret." It surely had a good test. At that time I was flat broke. I had about given up hope when I put the "secret" to work. At first I couldn't believe my sudden change in fortune. Money actually flowed in on me. Things I couldn't do before became easy for me. My business boomed ahead. Prosperity became my partner. Since that day I've never known what it is to want for money, friendship, happiness, health or any of the good things of life. That "secret" surely made me rich in every sense of the word.

My sudden rise to riches naturally surprised others. People asked me how I did it. I told them. And it worked for them as well as it did for me.

Some of the things this "secret" has done for people are astounding. I would hardly believe them if I hadn't seen them with my own eyes. Adding ten, twenty, thirty or forty dollars a week to a man's income is a mere nothing. That's merely playing at it. Listen to this:

A young man in the East had an article for which there was a nation-wide demand. For twelve years he "puttered around" with it, barely eking out a living. Today this young man is worth $200,000. He has built a $25,000 home—and paid cash for it. He has three automobiles. His children go to private schools. He goes hunting, fishing, traveling whenever the mood strikes him. His income is over a thousand dollars a week.

I could tell you hundreds of similar instances. But there's no need to do this, as I'm willing to tell you the "secret" itself. Then you can put it to work and see what it will do for you.

I don't claim I can make you rich over night. Maybe I can—maybe I can't. Sometimes I have failures—everyone has. But I do claim that I can help 90 out of every 100 people if they will let me.

The point of it all, my friend, is that you are using only about one-tenth of that wonderful brain of yours. That's why you haven't won greater success. Throw the unused nine-tenths of your brain into action and you'll be amazed at the almost instantaneous results.

The Will is the motive power of the brain. Without a highly trained, inflexible will, a man has little chance of attaining success. Yet the will, altho heretofore almost entirely neglected, can be trained into a wonderful power like the brain or memory and by the very same method—intelligent exercise and use.

If you held your arm in a sling for two years, it would become powerless to lift a feather, from lack of use. The same is true of the Will—it becomes useless from lack of practice. Because we don't use our Wills—because we continually bow to circumstance—we become unable to assert ourselves. What our wills need is practice.

Develop your will-power and money will flow in on you. Rich opportunities will open up for you. Driving energy you never dreamed you had will manifest itself. You will thrill with a new power—a power that nothing can resist. You'll have an influence over people that you never thought possible. And those are only a few of the things the "secret" will do for you. The "secret" is fully explained in the wonderful book "Power of Will."

I know you'll think that I've claimed a lot. Perhaps you think there must be a catch somewhere. But here is my offer.

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"One of our boys who read 'Power of Will' before he came over here jumped from $100 a month to $3,000 the first month, and won a $250 prize for the best salesmanship in the State."—Private Leslie A. Still, A. E. F., France.

Worth $3,000 to $30,000

"From what I have already seen I believe I can get $3,000 to $30,000 worth of good out of it."—C. D. Van Buskirk, Gen. Agent, Northwestern Life Insurance Co., Cedar Rapids, Ia.

$897.00 Profit First Week

"Power of Will" is a compilation of sanity forces. My first week's benefit in dollars is $900—cost $3.00; profit, $897.00."—(figure what his yearly profit would be)—F. W. Heywood, 916 Tribune Bldg., Chicago, Illinois.

Another 50% Increase

"More than a year ago I purchased 'Power of Will' and I firmly believe that it—and it alone—has enabled me to increase my salary more than 50 per cent in that time."—L. C. Hudgens, Boswell, Okla.

Among over 400,000 users of "Power of Will" are such men as Judge Ben. B. Lindsey; Supreme Court Justice Parker; Wu Ting Fang, Ex.U. S. Chinese Ambassador; Assistant Postmaster-Gen. Britt; Gov. McKelvie of Nebraska; General Manager Christeson of Wells-Fargo Express Co.; E. St. Elmo Lewis, Former Vice-Pres. Art Metal Construction Co.; Ex-Gov. Ferris of Michigan, and many others of equal prominence.

Send No Money

Send no money—no, not a cent. Merely clip the coupon and mail it to me. By return mail you'll receive not a pamphlet, but the whole "secret" told in this wonderful book, "POWER OF WILL."

Keep it five days. Apply some of its simple teachings. If it doesn't show you how you can increase your income many times over, mail the book back. You will be out nothing.

But if you do feel that "POWER OF WILL" will do for you what it has done for over five hundred thousand others—send me only $3.00 and you and I'll be square.

If you pass this offer by I'll be out only the small profit on a $3.00 sale. But you—you may easily be out the difference between what you're making now and an income several times as great. So you see you've a lot—a whole lot—more to lose than I.

Mail the coupon or write a letter now—you may never read this offer again.

A. L. PELTON
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You may send me "Power of Will" at your risk. I agree to remit $3.00 or remail the book to you in five days.

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Let a Master Teach You Music

You can take music lessons under America's Master Teachers in the privacy and quiet of your own home at small cost. You can learn to play any branch of music in a short time with the same ease and success as though you came to Chicago to study. You can thus satisfy your musical ambitions whether for pleasure, accomplishment, or professional success. The lessons are a marvel of simplicity and completeness. The ideal of a genuine conservatory of music for home study based upon lessons containing the cream of the life's teaching experience of master musicians reinforced by the individual instruction of specialists is now attained.

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Public School Music

Write, telling us the course you are interested in and we will send our catalog describing the course you want.

University Extension Conservatory

358 Siegel Meyers Building **Chicago, Illinois**

Hotel Clerks in Big Demand

Hundreds of openings every week in the 20,000 hotels in the United States; salaries up to $300 per month with the finest of meals, and often your own private room.

Front clerks, room clerks, night clerks, mail clerks, key clerks, are always in demand. No unemployment, no "lay-offs" in hotel work. Bright, capable men behind the front office desk are right in line for promotion to Assistant Manager and Manager. Statistics show that ONE IN EVERY TEN HOTELS WILL HAVE AN OPENING AS MANAGER THIS YEAR.

You can qualify for one of these pleasant-well-paid positions as hotel clerk, with a few spare time hours a week given to the simple, easy, clear lessons of the Lewis School. Special classes now forming for front office training, under the personal direction of Clifford Lewis—a hotel expert of national reputation. The training will in no way interfere with your present activities.

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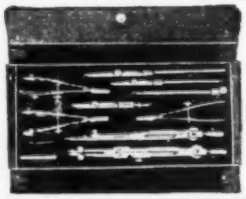

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Pocket case 4x8¼ inches—velvet lined — instruments constructed of solid nickel silver and steel—guaranteed. Order now—supply limited. *Free illustrated particulars.*

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Examinations soon. $1600 to $2300 a year. Steady life-time job. Common education sufficient. No "pull" necessary. Mail coupon for Catalog 812

Patterson Civil Service School, Rochester, N. Y.

Sirs: Send me without charge your Catalog 812, describing this and other fine U. S. Government positions.

Name.....
Address.....

Patterson Civil Service School, Rochester, N. Y.

Easier to Earn $1000 a Month Than $18 a Week

The Inspiring Story of Charles L. Berry

IT is a whole lot easier to earn $1,000 a month than $18 a week. I know—because I used to earn $18 a week, and now I am making $1,000 a month. I used to work mighty hard for $18 a week—constantly worried over money matters, with no chance to enjoy the pleasures and luxuries of life.

Then suddenly I discovered the way to big money. Quick as a flash my earnings jumped to $1,000 the very first month. Since then I have earned as high as $2,130 in one month. And it was all so amazingly easy! I do not work half as hard for $1,000 a month as I did for $18 a week. My hours are short—I am independent—I travel—meet big men—and I enjoy every minute of my work.

In fact, I do not understand why any ambitious man should work for small pay when big earnings are within such easy reach. *For what I have done, anyone can do.* There's absolutely no doubt about it.—and almost everyone has more advantages than I had to start with.

$1000 the First Month

I started as a farmhand, making about $60 a month. A case of sunstroke forced me to quit. Then a job as a clerk in a variety store at $18 a week. Probably I would have gone on indefinitely working for small pay if I hadn't discovered the secret of earning big money. I discovered that **the big money is in the Selling end of business and any man of normal intelligence and ambition can quickly become a Master Salesman.**

Heretofore it was thought that a man must be a "born" Salesman. But now the wonderful opportunity to achieve quick and big success is thrown open to everyone through the National Salesmen's Training Association. This is an organization of top-notch Salesmen and Sales Managers formed just for the purpose of fitting men to become Master Salesmen.

I owe my success to the day I wrote to this great organization for particulars of their system of Salesmanship Training and Free Employment Service. The answer I received absolutely astounded me—it was nothing short of a revelation. I read how hundreds of men after slaving for years at small pay, suddenly stepped to magnificent earnings. There was Warren Hartle of 4425 N. Robey St., Chicago, for example. After ten years in the railway mail service earning $900 to $1,600 a year, he became a Master Salesman and made $1,000 in thirty days.

George W. Kearns of Oklahoma City earned $524 in two weeks. He had previously been earning $60 a month. And C. W. Campbell of Greensburg, Pa., wrote: "My earnings for the past thirty days are $1,562 and I won second prize in March, although I worked only two weeks during that month."

In short, the PROOF was so overwhelming that I immediately decided to accept the offer of the N. S. T. A. to make me a Master Salesman. This did not interfere with my work at all. It just required some of my spare hours at home. Almost before I knew it I found myself a thorough master of the Secrets of Selling and ready to accept a position as Salesman with a big company to which the N. S. T. A. recommended me. My first month in this position netted me $1,000. In one step I left behind my small pay job for the magnificent earnings and fascinating career of a Salesman.

FREE—AN AMAZING BOOK

That is why I suggest that if you are ambitious to take **your** place in the ranks of the big moneymakers, write to the N. S. T. A. Entirely free of cost you will receive a wonderful Book on Salesmanship, and amazing proof that no matter what you are doing now you can quickly become a Master Salesman, in your spare time at home. You will read how others are to-day earning five, ten and fifteen times as much money as they had ever earned before.

It was worth $1,000 a month to me to write to the N. S. T. A. It may be worth that much or more to you. Just mail the coupon. There is no cost or obligation. Address National Salesmen's Training Association, Dept. 12-W, Chicago, Ill.

National Salesmen's Training Association
Dept. 12-W, CHICAGO, ILL.

Please send me your Free Salesmanship Book and Free Proof you can make me a Master Salesman. Also tell me how the Free Employment Service of the N. S. T. A. will help me to a Selling position and send list of business lines with openings for Salesmen.

Name.....

Address.....

City..... State.....

5,000,000 Men Are After the Routine Jobs—

Break Away From This Competition—

Command Big Pay!

When business slackens, can your employer "let you go"—and tomorrow hire almost any routine man from this army of 5,000,000 men and find him competent to take your place?

Observe that when a business trims its crew, it is almost never the *big-pay* men who walk the plank.

Not only are the specialists retained—the Accountants, Production Managers, Traffic Managers, and, in fact, the managers of any of the important departments of a business—but they are frequently *promoted*. Other concerns are in need of their ability, and come bidding for their services.

Many of these men who today are going rapidly ahead were no better off than you, several years ago. Today, while others walk the streets, these men walk into the better jobs.

There is no mystery about their swift advancement. There is a way that's interesting and practical whereby any man of average intelligence can get the training that will put him in the big-pay class. Literally thousands of ambitious men have found this way in the LaSalle Problem Method. They have chosen the line of work that most appealed to them—then, right in the quiet of their own homes, without losing an hour from work or a dollar of pay, they have solved the problems they today are meeting in the better jobs.

Situations which they face today are identical with those they faced in spare-time study. They have been shown exactly how to meet them—guided every step of the way by some of the ablest business men, in their respective fields, in America.

Read these statements, typical of over 1,000 which we will send you in booklet form and which represent but a small part of the many thousands of similar letters in our files:

"The most efficient and most rapidly promoted men in our whole organization are LaSalle-trained."

"Promoted to General Manager."

"Now a director in two banks."

"From bookkeeper advanced to chief accountant—salary increased 500%."

"Passed bar examination with highest grade, in competition with many resident school graduates."

"The Problem Method increased my income $2,500 a year."

"Passed C. P. A. examination. You will be interested to know that 50% of the successful candidates were LaSalle-trained men."

An analysis of the letters from 1,089 LaSalle members reporting definite salary increases during 3 months' time shows an *average increase per man of 56%.*

While the axe hangs over every business office, it's the time of all times to free yourself forever from the treadmill jobs.

Mark on the coupon the training that attracts you, sign and mail it to the University. It will bring you full information, together with particulars of our convenient-payment plan; also your free copy of the inspiring book—"Ten Years' Promotion in One."

Break away from the crowd of routine pluggers. Find out today what YOU must do to put yourself among the men who command big money. Mail the coupon NOW.

INQUIRY COUPON

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Please send me catalog and full information regarding the course and service I have marked with an X below. Also a copy of your booklet, "Ten Years' Promotion in One," all without obligation to me.

- ☐ Business Management
- ☐ Higher Accountancy
- ☐ Traffic Management—Foreign and Domestic
- ☐ Railway Accounting and Station Management
- ☐ Law—Degree of LL. B.
- ☐ Commercial Law
- ☐ Industrial Management Efficiency
- ☐ Business Letter-Writing
- ☐ Banking and Finance
- ☐ C. P. A. Coaching for Advanced Accountants
- ☐ Personnel and Employment Management
- ☐ Modern Foremanship
- ☐ Expert Bookkeeping
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking

Name..... *Present Position*.....

Address.....

AN INTERESTING EXPERIMENT

Stand in front of your mirror and look your body over carefully from head to foot. Observe the present condition of your neck, shoulders, chest, arms, waist-line and legs. Take your measurements by tape and focus your reflection thoroughly in your mind, so that you will remember what you saw. Then take up some scientific, systematic, progressive training that has been thoroughly tried and proved, and work diligently fifteen or twenty minutes a day for one month. Again stand before your mirror and note the wonderful transformation that has taken place.

LATEST PHOTOGRAPH OF
EARLE E. LIEDERMAN

You Will Not Know Yourself

An entirely new man will reflect from the glass. Your neck will be stronger, your shoulders broader, your chest deeper, your arms enlarged with bulging muscles and your legs will have a more pleasing form. Your whole physique will be completely transformed. Isn't this worth thirty days' effort? *Think of it. A new person in so short a time.* I do not promise that you will become *a finished athlete* in this short space of time, but you can become this in a very few months. Have you the *moral courage* and the *will* to take up a course of physical training that has been pronounced the *finest in the world* for muscle building?

The Result

With the enlarging of your muscles will come *unlimited energy.* Do you know what this means? Unlimited energy means never to feel tired. Even after a hard day's work you will feel refreshed. You will feel like running and jumping at all times. You will just thrill with vitality and never know another sick day. With enlarged muscles comes great strength, which is not to be sneered at. You never can tell just when you will need this. It is a wonderful feeling to know that you can play a man's part at all times should the occasion warrant it. You need fear no one.

All This Means Success to You

Are you satisfied with your present earning capacity? With a healthy, vigorous constitution, your personality will be so strong that you will command respect. This will not only bring success in the social world, but you will reap your reward financially many times over.

The 8th Edition of My Latest Book
"MUSCULAR DEVELOPMENT"

is just off the press. It contains 26 full-page photographs of myself and some of the world's best developed athletes, whom I have trained. These men are not only perfect specimens of physical manhood but are noted successes in their business careers as well. If you will faithfully follow my instructions to the best of your ability, there is positively nothing in this world that can keep you from success.

I want every one who reads this page to send for a copy of this Booklet. There was nothing of its kind ever published before and it will interest and benefit you greatly. The pictures alone are well worth looking at and will act as an inspiration to you and all who see them. It is free. I simply ask you to send me 10 cents in stamps or coin to help cover the cost of wrapping, packing, mailing, etc. Do not put this off, for this little book may be the turning point of your whole life. *Sit down right now, this very minute, fill out the coupon and send for it while it is on your mind.*

EARLE E. LIEDERMAN
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Dear Sir:—I enclose herewith 10 cents, for which you are to send me, without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

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HERE is the latest, most complete and most authorative information on Carpentry and Building ever gotten together. 25 well-known experts gathered it from hundreds of sources and made it into this handy, spare-time reading course that you can read at home. Every building problem is explained—from barns and cottages to modern, fire-proof structures and up-to-date industrial plants. Thousands of pictures, plans and blueprints illustrate the books and make everything as simple as A-B-C. You don't have to know a thing about building to understand them. If you are a carpenter, or have a knack for building things, or if you are interested in building in any way, these books will teach you things you wouldn't learn in a lifetime of hit-or-miss experience.

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This is the 1920 edition, with large folding blueprints and detailed instructions on how to read and understand them. Besides teaching everything known to building, the use and care of tools, selecting material, estimating, etc., it covers everything in the building, too—such as Heating Plant—Plumbing—Electric Wiring—Water Supply. ***Here are a few of the thousands of things explained:*** Carpentry—Stair Building—the Steel Square—Plastering and Painting—Drawing—Blueprint Reading—Superintendence—Heating and Ventilating—Sanitary Appliances—Estimating—Contracts—Specifications—Building Code—Interior Trim—Roofing—Drawing Plans, etc.

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Don't send any money. We want to prove to you that these books are all we claim them to be. Just fill out and mail the coupon below and we will send you the whole set of five volumes of Carpentry and Contracting to use as you please for one week FREE. If you like the books and want to keep them, send us only $2.80 and the balance at the rate of $3.00 a month until a total of $24.80 is paid. If you don't want to keep the books, send them back at our expense and that will end the matter. There are no strings to this offer—you are the sole judge. Mail the coupon now. Remember, it does not obligate you to buy.

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Please send me the five-volume set of Carpentry and Contracting books for seven days' examination by express collect. I will send you $2.80 within one week and $3.00 each month until I have paid **$24.80**. If I decide not to keep the books I will return them within one week at your expense and will owe you nothing. The purchase of these books entitles me to a consulting membership in your society.

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Permanent Positions

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You can get one of these good positions if you really want it. All you need is the right kind of preparation. The men and women who get the highest grades in the examinations are practically certain of appointment.

Let the International Correspondence Schools help you to secure a Civil Service position just as they have helped thousands of other ambitious men and women. Here are three typical cases:—

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"When I first took the Civil Service examination for a Government position in Washington, I failed to pass the test, but after carefully studying the I. C. S. Civil Service Course I again took the examination and passed with an excellent rating, receiving my appointment in Washington in less than thirty days after being notified of my grades.

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"When I enrolled for a Civil Service Course with the I. C. S. I was a farmer, and my earnings were very uncertain. Your course made it possible for me not only to pass the competitive examination, but to give a good account of myself by rendering satisfactory service. As a result of the course I became a Railway Mail Clerk, and my salary at this time is $210 a month."

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"After taking your Civil Service Course I tried the examination on May 15. I received notice of being a Certified Substitute on July 2, and on July 3 I received my rating from Washington, D. C. On July 7 I was appointed as Clerk in the St. Paul Terminal. I wish to express my gratitude to the I. C. S. for what the course has done for me."

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1 Chance for Success

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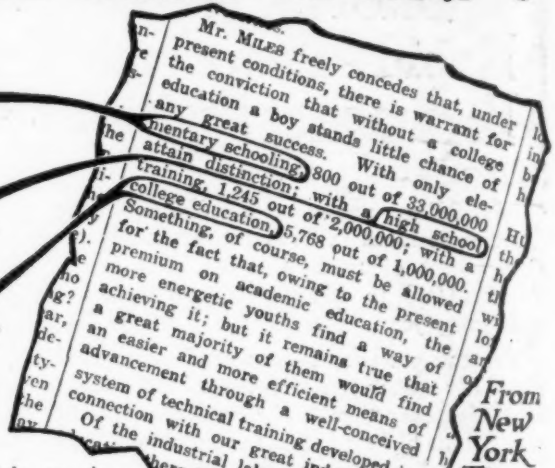
Mr. MILES freely concedes that, under present conditions, there is warrant for the conviction that without a college education a boy stands little chance of any great success. With only elementary schooling, 800 out of 33,000,000 attain distinction; with a high school training, 1,245 out of 2,000,000; with a college education, 5,768 out of 1,000,000. Something, of course, must be allowed for the fact that, owing to the present premium on academic education, the more energetic youths find a way of achieving it; but it remains true that a great majority of them would find an easier and more efficient means of advancement through a well-conceived system of technical training developed in connection with our great industries. Of the industrial laborer's desire for

From New York Times Aug. 30th 1921

Thus does a great newspaper comment editorially on a recent report on industrial education made to the American Society of Mechanical Engineers.

Think what these figures mean! With only an elementary education, you have just one chance in 41,250 to achieve success. A high school education increases your chance nine times. With a college education, or its equivalent, you multiply your chance by two hundred and thirty-eight.

Only a few men out of every thousand can go to college or to a good technical school. The great majority must find some other way of getting a special education.

The United Y. M. C. A. Schools furnish one reliable way of doing this through the use of **spare hours without giving up present employment.** Thousands of superintendents, foremen, department managers, engineers, accountants, salesmen, business executives, etc., owe their positions to spare-hour study under Y. M. C. A. direction.

In the 240 United Y. M. C. A. Spare-Hour Courses there is one to fit your need. United Y. M. C. A. correspondence instruction gives you: (1) the most service for the least money; (2) careful guidance in selecting a course; (3) the personal, sympathetic attention of an earnest instructor, and (4) as much encouragement to complete your course as to begin it.

During the last twelve months more than 140,000 ambitious young men have enrolled with the United Y. M. C. A. Schools. Advance with them! Don't drudge along in poorly paid or distasteful work when the world is demanding trained heads, men able to take positions as leaders, who can create, execute and direct.

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☐ Building Construction	☐ Draftsman	☐ Highway Engineering	☐ Salesman	

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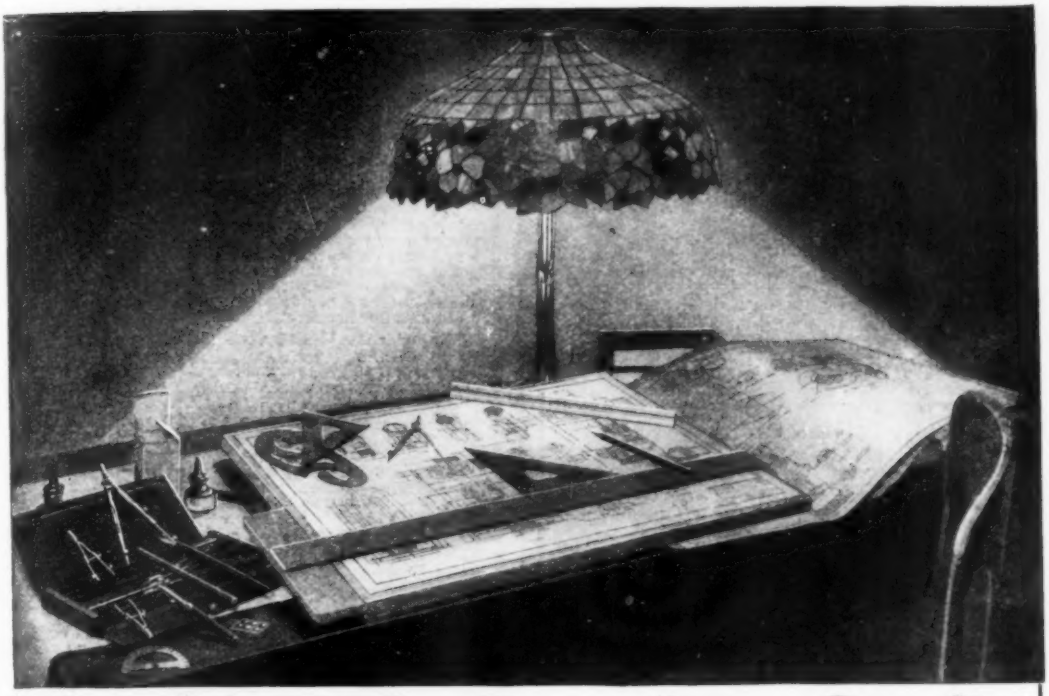

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Everything used by expert draftsmen given you absolutely free. Outfit includes "professional" complete set of fine drawing instruments with double set of compasses and dividers all in velvet lined case. Drawing board, T square, two triangles, protractor, universal curve, triangular standard scale, water-proof ink, pens, pencils and all accessories—furnished you free in this expert's complete outfit.

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Easy to Learn at Home

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The Coyne Home Study Course guarantees to train you. Remember, the Coyne Trade and Engineering Schools are recognized by Educators all over the world. Students come from all over the **world** to get Coyne training. Why. Because of the Coyne Schools' long established, tremendous reputation for successful teaching by its great staff of experts. Coyne is not a "one man" school but a great educational institution. 22 years old, an acknowledged leader and originator. Coyne originated the "Learn by Doing" method now endorsed by educators everywhere. Coyne has graduated thousands of successful, prosperous men all over the world. You can't make a mistake if you write for the Coyne free book. Coyne students say every minute of the course was enjoyable. Some students took **good positions 3 months before their course was finished.**

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There is a tremendous demand for trained draftsmen. Now is the time to start. Draftsmen get good pay from the start and can work up to $500 a month *and more*. Draftsmen are needed everywhere. Once you are trained you can choose your own business and work in any part of the country you please. Coyne training makes everything easy for you.

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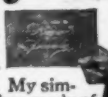

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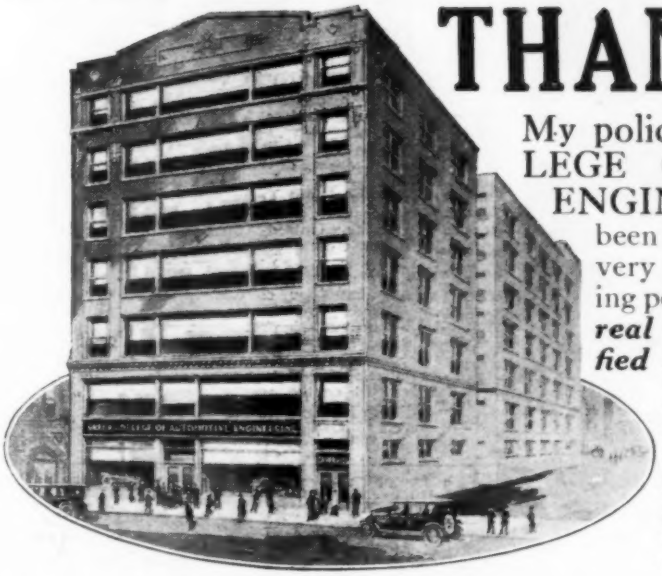

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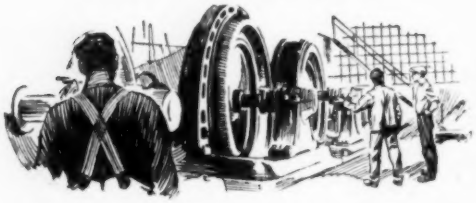

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START others in vulcanizing business on $50.00 capital. You make 20%. 10c brings particulars. Jo-Al Tire Service, 512 77th Street, Brooklyn, N. Y.

CAPITALIZE your spare moments. Start while the opportunity exists. Dignified, profitable business without experience or capital. Service, Times Plaza, Box 64, Brooklyn, N. Y.

HOME manufacturing — Mechanics, and household necessities. Machinery, experience, or canvassing unnecessary. Enormous profits. Home Manufacturers' Association, 230 Court, Los Angeles, Calif.

I MADE $30 a week home. French bread-making. 15 years' experience; free booklet tells. Ashbrook, 67, Marengo, O.

MAKE Easy Money in your spare time. Write Bennie Nortwed, Kellerton, Iowa.

STEADY work for life! 400% profit to co-partners who join us, on a royalty basis, in manufacturing a patented article every man and boy should have. Send 25c (coin) for sample and judge for yourself. We furnish machine free. Address Inventors' Co-operative Manufacturing Association, Albany, New York.

ONE Man in Each State will be asked to join my organization, open a branch office, and share in the resulting increased profits from a business that I originated twelve years ago and have built into a mammoth World Wide Industry. This proposition requires a few hundred dollars as capital; but the chief qualification is that the applicant Must Be a Salesman. Not a boy, or a peddler, but a man of mature years, experienced in selling, and absolutely sold on the principle of Square Dealing as the only permanent means of succeeding in business. This is Not a new policy with my company. We have for years conducted these branch offices and we know that they pay big dividends to the fortunate owners. Write me for full details. M. E. Haywood, 516-532 No. Capitol Ave., Indianapolis, Ind.

STATE and county rights available to men capable of organizing and directing sales forces and able finance themselves to extent of $100 to $500. New, patented, small, low-prices universally-useful article selling through canvassers and stores. Fast seller. No competition. Substantial profits. If you state your situation fully in first letter, I can then immediately submit definite proposition and contract. C. W. Reynolds, Sales Manager, 1430 Engineering Bldg., New York.

OWN an Auto Grocery and Supply Car in your vicinity. Meeting with unqualified success in supplying city, town and rural trade. The door of the daily consumer. $100 to $150 net weekly income. Easy terms; principal payment of car can be made in monthly installments from profits derived from sales. No competition; no store expenses. $1150 required. Commerce Supply Co., 118 N. LaSalle, Dept. B, Chicago.

MAKE big money manufacturing marble, granite, tile, agate. Cost ten cents per square foot, sell at 75c. Fancy marble face brick, cost $15, sell $75 per 1,000. If you want to make several thousand dollars in the next few months, write for full information. Spencer Instruction, Dept. 703, N. Spring Street, Los Angeles, Calif., Master Cement Worker of the World.

OHIO manufacturer wants exclusive state and county distributors for article every auto owner needs. Over 200,000 satisfied users to date. Retails $5.00; costs you $2.50. Various state laws now pending make quick sales possible. About $1,000 necessary to finance, offering possible $5,000 profits next six months. Cleveland Auto Products Co., 5809 Euclid, Cleveland, Ohio.

ADVERTISING device; Patent applied for. You install. No selling. Collect for space from professional and business people. Cheap in quantity. Double money first month. Territory with device. F. A. Creed, 686 Hayes Street, San Francisco, Calif.

BRANCH Managers Wanted. Something new. Nothing like it. Open branch salesroom and school for Tire Repair Outfits in your locality. Three big money-making angles—income from tuitions—money from tire repairs by students—big commissions from sales of new equipment to graduates. You represent big $100,000.00 concern. Profit by national advertising campaign. All inquiries from your territory referred direct to you. E. S. White did $40,000.00 business so far this year. Many more branch salesrooms and schools needed. Five hundred good locations open right now. Little capital starts you. Write me personally for full particulars. In letter state age, selling experience, etc., in confidence. Drop me a line tonight. Address M. Haywood, Pres., 1345 Capitol Ave., Indianapolis, Ind.

MASTER Market Forecaster. Remarkable new book! Safety and profit for investors, brokers, millers, traders, all who deal in stocks, grain, cotton. Amazing opportunities! Free information, write today. Master Market Forecaster, Topeka, Kan.

SELLS like hot cakes. Big profits. New ironing wax, pad and asbestos iron rest. Clamps board, perfumes clothes. Working outfit 10c. Yankee Manufacturers, 380 Atlantic Ave., Brooklyn, N. Y.

PATENTS—Book Free. Send sketch for free Opinion of patentable nature. Talbert & Talbert, 434 Talbert Bldg., Washington, D. C.

YOUR Chance in life to own dignified, profitable business. We teach you the real estate, insurance and business brokerage. Earn $5,000 year. No capital required. Office at home. Representatives wanted everywhere. Stamp for booklet. Hayes Realty Association, Cincinnati, Ohio.

17 CENTS Profit on every 25-cent sale means Big Daily Profits. Box 500, Shreveport, La.

DOLLARS yearly in your backyard. No Mushroom dope. Particulars free. Metz, 313 East 89th, New York, N. Y.

MONEY in mail order business. Names of 30 supply houses 10c. Pennell Company, Covington, Ky.

AUTOMOBILE painting—furniture polishing taught by mail; after three weeks begin earning money. Blackwell's Paint & Furniture Shops, Desk 24, Easton, Md.

10,000 MONEY-MAKING plans, any one of which may increase your earnings $5 to $25 per day. Details 25c. Business Builders, Box 729, Minneapolis, Minn.

PUBLISH a Magazine—We furnish beautiful illustrated magazines, under your name and title as publisher, all ready to mail out. Sample copy and particulars 10c. Thompson Publishing Co., Cincinnati, Ohio.

$40 WEEKLY, making rubber stamps; full instructions to build paying business 25c. Peerless Specialty, Box 101, Waterville, Maine.

START a profitable Manufacturing Business. No experience required. I show you how. Big profits. A few dollars will start you anywhere. Particulars free. F. Piper, Box 764, Sacramento, Calif.

HAVING sold 150,000 of a household appliance in New England, we are ready to make general offer whereby direct salesmen are now averaging $45 weekly. No capital required. Unique method of obtaining interviews. Opportunity for District Management. The Reeves Company, 63 Broad Street, Milford, Conn.

WE Start You in Business, furnishing everything; men and women, $30.00 to $100.00 weekly operating our "New System Specialty Candy Factories" anywhere. Opportunity lifetime; booklet free. W. Hillyer, Drawer 4, Ragsdale, East Orange, N. J.

LET us start you in business. Send 25c for plan and first stock. Peerless Products Co., P. O. Box 890, E. Kenmore, Ohio.

LEARN Piano Tuning at Home. Booklet Free. Chicago School Piano Tuning, River Forest, Ill.

ADVERTISE. 28 words in 70 country-town Newspapers, $2.20. Pennell Company, Covington, Ky.

$100,000 CORPORATION wants capable man; open office; manage sales for High-Class New Device. Every Home a Prospect. Big money-making possibilities for the right man. Opening in every city. Cost $2.00, retails $5.00. $500 to $2000 necessary to finance exclusive agency. Scott Corporation, 82 W. Washington, Desk G, Chicago.

IF you have about $1,000 and capable of organizing sales force, to sell article needed by every merchant, wholesaler and retailer, which should net you $10,000 profits first year, write, Sales Director, 826 Reaper Block, Chicago.

SELL Us Your Spare Time. We will train you to write show cards for us. No canvassing or soliciting; we supply you with steady work; distance no object; will pay you from $15 to $50 a week. Wilson Methods, Limited, Dept. M, 64 East Richmond, Toronto, Canada.

INDEPENDENCE and prosperity await you in the furniture cleaning business. Course $1.00. Circular free. Send today. Address E. M. Ellis, 110 Riverside Ave., Newark, N. J.

IDEAS will earn you money! Live possibilities in the mail order field! Don't plug away all your life! Ten live, usable, proven ideas, only 25c. Write at once enclosing 25c. B. Grawoig, 1400 S. Spaulding Ave., Chicago.

RAISE Rabbits!! One of the most interesting and profitable industries in the world today. You can't fail if you read Rabbitdom's most authoritative book known as The 20th Century Rabbit Guide, written by an expert of 15 years' experience. Everything about rabbits worth knowing visualized in plain and forcible style. Contains 64 pages, fully illustrated; 21,000 copies sold. Price 50c prepaid. Write today for your copy. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago, Ill.

OPEN cleaning parlor at home. Clean hats, clothes, gloves, shoes, like new. Quick, easy method. Particulars Free. Byron, 27 Sta. I, New York, N. Y.

"SPARETIME"—Holiday business plan 10c. Hughes, 111 Hewitt, Los Angeles, Calif.

NICKEL plate automobile accessories, hardware, electrical parts. Big profits. Requires no capital. Simple battery process. Write today. Webster Engineering Co., Webster Groves, Mo.

MEN Wanted to earn $3,000 to $10,000 a year. Prepare quickly and easily through our amazing system for profitable and permanent business reclaiming waste paper for largest manufacturers in country. Boys do the work—you simply direct. Practically no investment necessary—a few dollars will start you. Simply send name for big free opportunity book—a post card will do. Write The Traub System, 303 Traub Bldg., Kansas City, Mo.

START a Paying Business of Your Own. Be a business man. Any location, 8,000 new Tire Vulcanizing and Repair Stations needed. Business always good. Are you ambitious? $100 will start you. Write at once. Wonderful opportunity. Equipment Co., 11 Canal, Cincinnati, Ohio.

I HAVE over 100 stores paying $5 monthly maintenance. You can do the same in your city. Six weeks' Detroit practice qualifies. Only one person in each city chosen. Midnight Alarm System, 6411 Mack Ave., Detroit, Mich.

12 WAYS to Start Mail Order and Home Business, 4c. Gaylord, Publisher, Rockland, Wis.

AUTO necessity of the highest merit that sells on demonstration; profits are liberal; exclusive territory open; excellent opportunity for a business of your own. Write Service Cushion Tube Co., 4010 E. 15th St., Kansas City, Mo.

SUBSTANTIAL manufacturing corporation wants capable men to establish branch and manage salesmen; $300 and upward necessary. Will allow expenses to Baltimore as explained. Address Secretary, 343 Courtland St., Baltimore, Md.

START Mail Order Business. Our Bargain Bulletins just off the press contain hundreds of fast-selling novelties. Our low prices will surprise you. Address Circle Sales Co., Dept. 18, Moline, Ill.

MILLER'S Profits $275 Monthly from HB Battery Charging. Fastest growing business today. Anyone successfully operates. $20 starts you. Balance payments. Profits pay. Write for proofs. Hobarth, Troy, Ohio.

START a chile parlor, candy kitchen, or cleaning, dyeing and pressing shop. Small capital. Details for stamp. Hand & Co., 7246 Cottage Grove, Chicago, Ill.

MANUFACTURE Extracts, and other necessities. 200% profit; we tell you how. Write White Manufacturing Drug Co., Box 322, Cincinnati, O.

EXCEPTIONAL Opportunity for Sales Manager capable of handling state distribution. Marvelous new Adding Machine. Retails $15. Work equals $350 machine. Tremendous possibilities. Unlimited profits. Write quick for details. Lightning Calculator Co., Dept. B, Grand Rapids, Mich.

GET into the specialty manufacturing business. Amazing profits. We will send you free book explaining our system. Write immediately. A wonderful opportunity awaits you. National Scientific Laboratories, 624 Main, Richmond, Va.

SLOT machines — Headquarters Premium Pin Gum Machines. Address today! Success Vending Company, 620 State St., Camden, N. J.

MAKE Big Money opening Safes and setting Combinations. Wayne Strong, Box 1430, Los Angeles, Cal.

MARBLE mixing instructions, covering wood or cement flooring ½ inch thick, fireproof, waterproof, low cost, sanitary, all colors. Particulars, 200 illustrations free. Chris Mahler, Box 122, Huntington, N. Y.

LET Me Show you how to make real money. Absolutely new proposition and new products. Materials cost $2.00, sell for $16.00. One man sold a thousand dollars' worth in a week. Exclusive manufacturing and sales rights to one man in each territory. Write today for booklet 5, Crouch, Chemist, 309 Broadway, New York.

LEARN the collection business. Good income, quick results. Interesting booklet, "Skillful Collecting," free. National Collectors Assn., Long St., Newark, O.

SILVERING Mirrors! My exclusive French Tartaric method opens enormously profitable business. Booklet free. H. Barstow, 514 23d Street, Oakland, Calif.

GOOD money easily earned at home, spare time silvering mirrors; no capital. Free instructive book tells how. Patterson & Co., Brooksville, Ky.

$3,000 TO $6,000 Yearly. Want it? Others are making it. Send check or money order today for our invaluable books "How to Sell Real Estate," $3.00—and "How to Conduct Real Estate and Insurance Business," $1.50. Absolute satisfaction guaranteed. Free catalogs. Realty Book Co., Dept. 52, Cleveland, O.

CHEMICAL Expert will furnish Formulas and Trade Secrets. All lines. Lists Free. W. L. Cummings, Ph.D., 228 Gordon Ave., Syracuse, N. Y.

MAIL Order Business is your opportunity. Brenizer's Famous Handbooks teach how to start small, grow big. Sell merchandise, service, ideas; enormous profits. Spare time to begin. Get complete set, 11 books, $2.50, and be posted. Brenizer, 335 Walnut, Philadelphia. Descriptive Catalog and big batch interesting mail order information, 25c. None free.

ENTER a new business. Earn $3,000 to $6,000 yearly in professional fees making and fitting a foot specialty, openings everywhere, with all the trade you can attend to; easily learned by anyone at home in a few weeks, at small expense; no further capital required, no goods to buy, job hunting, soliciting or agency. Address Stephenson Laboratory, 11 Back Bay, Boston, Mass.

BUSINESS Brokerage pays well. Easy to understand; particulars free. Write Eydman System, Box 647, St. Louis, Mo.

LEARN Plating, Etc. Profitable—Big Demand. Free Plans. Norman Rorick, 427 Carroll St., Akron, Ohio.

SAVE ¼ your coal or wood. Free circular. Pfeiffer Sales Co., Westfield, Mass.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

CHEMISTRY

CHEMICAL analysis honestly and correctly done by L. E. Tenney, Chemist, Colton, N. Y.

CHEMICAL Analysis. Chemical and Industrial Formulas. Burson Chemical Laboratory, 227 West Fourth Street, Ottumwa, Iowa.

FORMULAS AND TRADE SECRETS

NEWSHINE Auto and Furniture Polish. Best on Earth; cleans and polishes, leaves dry surface; costs 50c gallon; formula $1, no stamps. Snyder, Box 512, Marshall, Texas.

"POLISH" for Automobiles. Send 50c for receipt and full directions how to make and sell it. Gloss Auto Polish Company, General Delivery, Peoria, Ill.

CAN you Goldplate without electricity? Try this interesting experiment with my formula. 25c brings it. Fred Rutter, 3148 Lowe Ave., Chicago.

THOUSANDS maintain New York addresses. Why? Learn one secret of bigger sales. Free. David C. Way, 42 Broadway, New York.

3,000 FORMULAS and Trade Secrets, 400 pages, $1.00. Universal Book Shop, 4047 C N, Whipple, Chicago.

500 FORMULAS, Trade Secrets. Universal Book Shop, 4047 C N, Whipple, Chicago.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

REMARKABLE Discovery—Positively removes Tattoos, Coal Marks, Moles; [illegible] simple process. Original since 191[illegible] formula $1.00. Harding Co., Desk 2, 14[illegible] Dearborn St., Philadelphia.

FORMULAS—All kinds. Catalogue free. Bestovall Laboratories, 4047 C N. Whipple, Chicago.

BOOK of 1,000 formulas—one dollar. Charles Schroeder, Neillsville, Wis.

10,000 SELECTED scientific chemical, technological and practical recipes and processes including hundreds of so-called trade secrets for every business, alphabetically arranged in one large volume of 800 pages. Price $1.00 prepaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

FIVE Formulas $1.00. Sewing Machine Oil, Perfume, Toothache Drops, Darken Gray Hair, Leather Cement. Herbert Hill, 133 Greenwich St., Brantford, Ontario, Canada.

500 FORMULAS, 20c. Luminous paint—Resilvering Mirrors—Renewing dry batteries—Mechanics' Soap—Carbon remover. Puncture Plugger, 20c each. Entire collection, 50c. Ideal Book Shop, 5501 FL, North Robey, Chicago.

WANTED—Formulas for the manufacturing of asbestos products. West Monumental Asbestos Mine, Cisco, Calif.

MANUFACTURE Perfume. Formula all flavors $5.00. Deck, 2227 Wallace, Philadelphia.

FORMULAS—Guaranteed. Catalogue free. Clover Laboratories, 5510CL, North Robey, Chicago.

FORMULAS of the better sort. Write for our free catalog. National Scientific Laboratories, 623 Main, Richmond, Va.

1,000,000 FORMULAS, Trade Secrets, Processes for Every Business. $2.25. Ideal Book Shop, 5501 ML, North Robey, Chicago.

AGENTS WANTED

WHIRLWIND money-maker for agents—sample free. Sell powdered Hanslick, an absolutely new, non-competitive, and unbeatable hand cleanser. Removes grease, grime, ink, paint, etc., without slightest injury to skin. Its use spreads like wildfire. Cheaper than all others. Sells in cans (or bulk with dispensers) to garages, autoists, mechanics, factory and office folks, to housewives, hardware stores and to auto supply houses. Huge quantities used weekly by mercantile houses. (Names on request.) Big repeat business assured. Exclusive agencies, crews working for you, fast sales, splendid profits and a permanent business for hustlers. Live ones can clean up $500 a month. Send 2c stamp for postage on Free sample. Complete sales plan goes with it. Write quick to Solar Products Company, 124 W. Lake St., Chicago, Ill.

AGENTS: Quick sales! 350% profit. Klean-Rite magic washing wonder. Washes clothes without rubbing. Sells for 25c—you make 19c. Distributing samples free. Write quick. Bestever Products Co., 1941 K12, Irving Park Blvd., Chicago.

AGENTS, Men or Women, full or spare time, earn $25.00 to $100.00 a week and be your own boss representing the Ho-Ro-Co Mfg. Co., manufacturers of the wonderful Ho-Ro-Co Tonic, the great blood purifier and system builder; some profit-maker. Ho-Ro-Co Medicated Skin and Scalp Soap for the baby, toilet, bath, skin and scalp; a repeater. Over 100 other fast-selling specialties, toilet preparations, perfumes, flavoring extracts, spices, medicinal preparations and household specialties. Every item a fast seller and a big profit-maker. Don't fail to ask for our free sample case offer. We furnish advertising matter and samples free of charge. Ho-Ro-Co representatives are successful. Write today. Ho-Ro-Co Mfg. Co., 154 Locust St., St. Louis, Mo.

AGENTS—Send for sample "Fretnot"—the washday wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credits given. Don't call. P. M. Motter & Sons, 20 E. Jackson Blvd., Chicago.

AGENTS—Marvelous product for renewing Silverware. Old silver made bright as new instantly. Clean, quick, safe to use. No rubbing or dirt. Being used daily by Hotels, Restaurants, etc. House to house agents clean up $100 weekly. Territory going fast. Write now for particulars. Sample 50c postpaid. Silver Witch Laboratories, 130-132 Nassau St., New York City.

WELCOME before you call—7 orders out of 10 hearings. Get rid of the stigma, "canvassing." We have a dignified piece of organization work we want to have done in your community that will pay $3,000 a year and up. Plan gets introduction for you, and if you are like our average representative, you will get 7 orders out of 10 hearings, even in these dull times. Write for full details; give address. Kit-chin-Kit Corp., Dept. P-12, Evanston, Ill.

AS side lines nothing beats our can opener, spark plug, and other live specialties. All new. Big demand. Good repeaters. Smith, 1316 North American Bldg., Chicago.

$100 WEEKLY with 500% profit Repeater easy. K Home, 1957 Warren, Chicago.

SKAT Silver Polish—territory still open. Write Skat, Hartford, Conn.

JUST in time for Inventory and Income Tax! Thousands awaiting Marvelous New Calculating Machine. Retails $15.00. Work equals $350 machine. Automatically adds, substracts, multiplies, divides. Lightning Speed. Errors impossible. Five-year guarantee. Genuine opportunity for live agents. Every demonstration means Amazing Profits. Write quick for free trial offer and exclusive rights. Lightning Calculator Co., Grand Rapids, Mich.

$10.00 PER day made selling Raised Letter Signs in gold and colors. 2,000 sold in this city in 30 days. Any one can do the work. Outfit complete $1.25 prepaid. Your name plate, samples, and particulars, 25c. Money in it for you. F. R. Gaudin, 227 Temple Block, Los Angeles, Calif.

AGENTS—Wonderful New Invention. New Heat Indicator for country and city homes. Tells exact heat in any oven. No guesswork when baking or cooking. Enormous demand. Low priced. Every housewife wants one. Pays for itself in one month. Write for terms and sample. Jennings Mfg. Co., Dept. 1168, Dayton, Ohio.

TAILORING Agents: Wonderful all-wool, one-price line, retails $29.50 per suit; $10 to $20 cheaper than retail prices; you collect profit at once; we ship C. O. D. to customer for balance; exclusive territory; hustlers wanted; none other considered; write fully; state experience. Sales Manager, 831 West Adams St., Chicago, Ill.

BIG Profits Selling New $3.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Co., 1458W Hollywood Ave., Chicago.

FOR the Holidays. Our Ex-Cel Luminous Crucifix which "shines in the dark" is the most appropriate gift of all. An instant to demonstrate and the sale is made. Big profits. W. G. Hannan Co., Dept B, 57 East 18th St., Chicago.

WE pay $8 a day, men or women, taking orders for high class made to order tailored neckwear. A strictly high grade guaranteed proposition. Big money for spare time. Write for sample outfit. Better-Made Cravat Co., 1309 Clinton Bldg., Columbus, Ohio.

IF you are now selling twisted wire brushes, toilet articles, mops or household specialties, you should carry our side line. Sanitax Hair Brushes, etc., do not conflict with any other line. Splendid profit makers. Sanitax Brush Co., 2358 Wabash Ave., Chicago.

AGENTS—Sell rich-looking imported 36x68 rugs, $1 each. Carter, Tenn., sold 115 in four days. Profits, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug, prepaid, $1.39. E. H. Condon, Importer, Stonington, Maine.

AGENTS, Canvassers: Hard times cause many crimes. Hence the unprecedented demand for the inexpensive safety window catch we manufacture. Without an equal. Attached instantly without tools. Sells to housewives at sight. Burg-La-Proof Window Catch Mfg. Co., Everett, Mass.

SAVE coal: Steam radiators filled with air can't radiate heat. Leskole air valves automatically release the air, admitting, with less steam, all the heat your coal produces. Guaranteed. $1.75. Happy agents wanted. Leskole Air Valve Co., 42 Broadway, New York.

AGENTS! 1921's greatest sensation. 11-piece toilet article set selling like blazes at $1.75 with $1.00 dressmaker's shears free to each customer. Get lined up for Christmas rush. E. M. Davis Co., Dept. 506, Chicago.

PORTRAIT Agents—I cleared $50,000 taking orders. I tell how in Free circular "Profits in Portraits." Samples free. 24 hours service on Prints, Finished Portraits, Frames. Friedman's United Art Studio, Dept. 8, 127 N. Dearborn, Chicago.

BIG Profits and easy, fast sales—every woman buys a B. & G. Waterproof Apron—they're better. Your profits larger—no capital required. B. & G. Rubber Co., 618 Penn Ave., Pittsburgh, Pa., Dept. 98.

AGENTS, Men and Women, on Farms and small towns everywhere, sell high-grade necessity. The Dabrite light demonstrates its own superiority. Moderately priced. Guaranteed. $75.00 to $100.00 weekly. Sample Free. Billings, 1626B West 34th, Chicago.

AGENTS—Big money taking orders overcoats, pants, blankets, direct Woolen Mill to wearer. No deliveries. No capital required. A knockout. Donahue made $27 first day. Complete outfit free. Taylor, Wells, 2740 N. Paulina, Chicago.

PROTECT Your Rights. Write for Record of Invention, which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 6126, Columbian Bldg., Washington, D. C.

UNDERSELL retailers on an article everybody needs and buys. Sells itself. No competition. Over 100,000 sold last year. 100% profit; $10 to $25 daily easy. Halvorsen, 108 West Lake, Dept. B, Chicago.

WASH-WITH-EASE, quick seller; over 100% profit; confidential selling secret; wash silks, white and colored goods, flannels. Sample package 15c. Wash-With-Ease, 1710 Addison St., Chicago.

$40.00 WEEKLY (whole or part time) selling guaranteed Hose, Waterproof Aprons, Shampoo Capes, Toilet and Sanitary necessities. Credit given. Jas. C. Bailey Co., Dept. M3, Chicago.

AGENTS: Sell the Shimmy Dog, does a lot of funny stunts; everybody wants one. Sample $1.00, prepaid. The L. Liebig Co., Beaver Dam, Wis., Desk 10.

PATENTS and Trade-Marks. Send for free "Inventor's Record" for preserving record of your invention. Advice free. Wm. H. Mulligan, 35 Woodward Bldg., Washington, D. C.

PREPARE and market your own products—Master formulas; manufacturing processes; trade secrets; commercial information. Particulars free. The Thaxly Co., Dept. 10, Washington, D. C.

AGENTS: Sell Famous Flying Horses, Self-propelled, child exercisers, latest sensation in the toy line. Send $3.25 for sample. The L. Liebig Company, Beaver Dam, Wis., Desk 10.

MAKE Money at home making toys—we show you how. Send 50c (no stamps) for complete working drawings and instructions. Dekalb Designing Co., Decatur, Ga.

MAKE 125% profit selling Phenlab Non-Inflammable Spot Remover. Sells fast and repeats. Sample 25 cents. Zeidner Brothers, 261 So. Fourth St., Dept. M, Philadelphia, Pa.

AGENTS—$6-$12 a day. Sell Nelin's Bitter Sweet Chocolate Candies. Free samples get big repeat business. 150% Profit. Nelin, Dept. 70, Rockford, Ill.

AGENTS—Make 100% profit; Wonderful Milakloth sells on sight; polishes silverware without powders or pastes; great opportunity for hustlers. Address Miller Brothers, Allendale, N. J.

ALUMINUM Cement. Mends all Metals. Requires no acids or Soldering Iron. Agent's price $1.00 per dozen; wholesales $2.50. Superior Manufacturing Co., Oakland, Calif.

PROTECTOPHON — Automatic record cleaner, 90% profit; sample 50c. One doz., including sample case, $4.00 prepaid. Standard Specialties, 1126, 8 E. Randolph, Chicago.

GENUINE Buckskin Gloves direct from Factory, $3.95. Made from selected skins. Agents wanted. Address Quaile-Angus Co., Desk 35, Gloversville, N. Y.

WOULD good durable paints and varnish 50c gallon interest you? Then write today. Dept. 2, Emmelmann Bros. Mfg. Co., Indianapolis, Ind.

EARN $5-$20 weekly. No mail order or canvassing for you. Plan 10c. Palace Mfg. Co., Toledo, Ohio.

IF you need good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

AGENTS—Texe Remedies 200%. Address Int'l. Remedy Co., 1331 Franklin, St. Louis, Mo.

WITHOUT Effort. Not less than $225 per month from investment of $7.50. Does a regular guaranteed income interest you? If you are energetic, capable and a hustler, you can make over $1,200 per month clear, handling a necessity in every home; satisfaction guaranteed. Unlimited possibilities. 100% profit clear. National demand for nationally advertised and approved appliance. No slackers nor curiosity seekers wanted. Men with pep and get-up. Write to us for a confidential sales plan and particulars. Lock-Box 423, Columbus, Ohio.

AGENTS: We guarantee to pay $12 a day taking orders for 2 in 1 Reversible Raincoat. One side handsome Raincoat, reverse side fine dress coat. Something new. Latest style. Guaranteed waterproof. No capital required. You take orders. We ship by Parcel Post, and do all collecting. Commission paid same day your orders booked. Write quick. Thomas Mfg. Co., Class 1362, Dayton, Ohio.

$10,000 TO $20,000 per year. Manufacturer wants capable managers handle state and local distribution, wonderfully efficient device. Prevents Ford cars and trucks overheating hottest weather or freezing 60 below zero, running or standing. Makes engine run smooth and easy; greater speed and pulling power. Saves 50% of oil, repairs and engine troubles. Sold on absolutely money back guarantee. Greatest invention in years. Reference any bank in Chicago. Universal Engineering & Mfg. Co., 1110 S. Michigan Ave., Chicago, Illinois.

CALENDARS. Wanted—Men and Women to solicit orders for 1923 advertising calendars in January and following months, from Merchants, Garages, Manufacturers, Insurance Agents, etc. Samples furnished to salespeople who furnish satisfactory references and agree to work one county or more. Splendid Side Line. Sample outfit ten pounds. Commission paid on receipt of orders. Exceptional manufacturing facilities enable us to make prices low enough to secure business anywhere. The Fletcher Company, Inc., Orleans, Vt.

WE want hustling men and women to sell Miracle, the world's greatest cleaner. Washes clothes spotless clean, without rubbing. Contains no lye, lime, potash, acid, or caustic soda; is absolutely harmless to everything except dirt. Put up in attractive cartons; sells on sight, enormous repeater. We have the greatest proposition ever offered to Agents. Send today for free samples and particulars. Address, Columbia Products Co., Columbia City, Ind.

WONDERFUL Winter Auto Necessity invention. $1.00 sale means 75 cents Profit for you. Experience unnecessary. Absolutely New Specialty. Riley made $108 three days. Slocum first hour made $10. Every Automobilist buys after each quick demonstration. Carried in Pocket. Prevents Accidents. Better Service. Reduces Operating and Repair Expenses. Write Quick for Exclusive Territory and Free Sample. Secretary, Box 494, Hartford, Conn.

AGENTS—Opportunity is Knocking: A review of all books, etc., and years' experience has formulated into a complete selling plan, that will positively double your business. Features—A proven success, with no expense. Complete working description of agents' selling plan $2.00. You cannot afford not to use it. Address, Henry G. Miller, Box 113, Marion, Iowa.

AGENTS make $100.00 or more a week. Only two sales a day net you $16.50 a day or more. If you own a new Ford you can get in on this remarkable invention which until now was available only on cars costing thousands of dollars. Write or wire Factory Manager, 2425 Locust St., Philadelphia.

QUICK seller to automobile owners—high class useful article—no installing—no comebacks—low retail price—big commissions—examination at our expense—exclusive territory contract. Box 2071, Denver, Colo.

AGENTS: Sell full line of guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles, colors and finest line of silk hose. Often take orders for dozen pairs in one family; permanent customers and repeat orders make you steady income. Write for sample outfit. Thomas Mfg. Co., Class 462, Dayton, Ohio.

RAYLITE Diamond Rings, Scarf Pins, etc. Sensational new Diamond Discovery; have real Rainbow fire of Genuine Diamonds; Fools Experts; Sells like Wildfire. Artistic Honest Goods, very attractive prices. Manufacturers of Stretching Kuff Buttons, the marvelous shirt saver. Profits 500 per cent. Write today. Master Jewelers, Sheboygan, Wis.

OUR $5.00 auto Stop Light Signal selling like wildfire. Costs you $2.50. Over 200,000 satisfied Signal users to date. Attached in 10 minutes. $12.50 daily easy. Exclusive territory. Sales made easy by state laws pending. Cleveland Auto Products Co., 5815 Euclid, Cleveland, Ohio.

AGENTS Make $1.35 or more applying sets Lithogram Initials to automobiles, motorcycles, golf sticks, etc. Anyone can do the work in a jiffy. And everybody buys. Write today for particulars. Big money to be made. Lithogram Company, Desk 17, East Orange, N. J.

"SELL a live one"—Our device actually saves half the gas bill. A one-minute demonstration proves it to the most skeptical. Selling in almost every home. You make wonderful profit. Unusual opportunity to territory organizer. $2.00 brings a sample. Write for particulars. M. N. Russel Co., Dept. A. 335 So. High St., Columbus, Ohio.

A SKIN Food and Balm that is a Winner. Our Cream Superba very effective and delightful. For Everybody in the family. Big repeater. Send dime for postage for full-sized trial jar. Write today to Duo Co., Dept. C, Attica, N. Y.

HUSTLERS! Sell wonderful "Sly Laundry Tablets." 1 million sold, always repeats, exclusive territory. Sample, 25 cents. Sly Products Co., 437 Cham. of Com. Bldg., Los Angeles.

CASH in on your spare time. My novel plan tells how. No capital required. Information free. M. Stacey, 4020 Crutcher St., Dallas, Tex.

"FASTEST Selling" 50c Specialty, hotels, cafes, housewives. Sample, particulars 10c prepaid. Territory going fast. B. B. Factories, 4035 Minnehaha, Minneapolis.

MAKE $12.00 daily—wonderful sellers; sample free; write quick, both sexes, steady work. Address, Berton Bellis, St. Louis, Mo.

AGENTS: Just out. Automatic Record Cleaner for Phonographs. Sells on sight at $1. Not sold in stores. Exceptional proposition for crew managers. Hark Metal Specialty Co., 431 So. Dearborn St., Chicago.

AUTOMOBILE tow rope with special features. Low price, fast seller, fully guaranteed strongest and lightest on the market. Send $1.50 for sample and agents' and distributors' proposition. B. S. T. Sales Co., 412 Finance Bldg., Cleveland, O.

SALES Agents. Men or women. $240 a month. Steady employment. Take orders for Jennings New Guaranteed Hosiery for men, women, children. Written guarantee with each pair to wear and give satisfaction or new hose free. All styles. Finest silk hose. Low priced. Write for complete line of samples. Big money for spare time. Jennings Mfg. Co., Dept. 368, Dayton, O.

AGENTS, $8 a day taking orders for Insyde Tyres. Positively prevent punctures and blowouts. Guaranteed double tire mileage. Old worn-out casings will give 3 to 5 thousand miles more service. No tools needed. Just slip inside casing before replacing tube. Will not heat or pinch. Katz made over $500 first month. Biggest thing on the market. Low priced. Write for territory. American Accessories Co., B-1078, Cincinnati, Ohio.

FASTEST Selling Sanitary Brush line in America. Huge Profit-Making Opportunity for live men and women. Other specialties. Get complete details. Act quick. Best season at hand. AA. Silver-Chamberlin Co., Clayton, N. J.

PORTRAIT men. Try our artist bromide prints, best ever made, they lay flat for proof passing. Prints at cost if we do the finishing. United Service Art, Station D, Chicago, Ill.

AGENTS wanted everywhere for our Ideal Auto Whistles. Protected Territory and State Rights to experienced Accessory Salesmen. All or spare time. Address, Interstate Trading Co., 192 Market St., Newark, N. J.

BIGGEST Money Proposition offered. Guaranteed, Easy Sales. Newest Improved Razor, only $1.00. Built after $5.00 Type. Standard Safety Razor Corp., Pittsburgh, Pa.

AGENTS Wanted—Hundred dollars weekly selling your own holiday preparations. We furnish formulas, materials, etc. Write now. Willard Chemical Co., Dept. 3, 2651 Milwaukee Ave., Chicago.

AGENTS: Whirlwind seller! Novelty Automatic Cigarette Case. 200% profit. Particulars Free; Sample 50c. Write today. Tuscarawas Specialties, Box 922-M, Uhrichsville, Ohio.

A BUSINESS of Your Own—make sparkling glass Name Plates, Numbers, Checkerboards, Medallions, Signs. Big illustrated book free. E. Palmer, 39 Wooster, Ohio.

AGENTS: Large profits handling our new specialty; every call means sale. Free particulars. Address Box 717, Mora, Minnesota.

AGENTS Wanted—Sell new patent. Every Ford owner prospect. 75c for sample. Kankakee Dist. System, Kankakee, Ill.

AGENTS, Streetmen—Selfolite lights any fire while user sleeps, or other time, by itself. Performs surprising stunts. Newly patented; 25c, postpaid; money back. Particulars. Kaytwo Mfg. Co., Station A, Boston, Mass.

TANNING Cheap, quick way. Recipe Free. Agents wanted. R. N. Gilley, Carlton, Texas, Tanners.

SELL Something New. "The A-B-C of Business" for business men. 50c copy. Agent's terms. Forbes Kinghorn, 110 Howard St., Pittsfield, Mass.

AUTOMATIC signals. Easy sales—big profits—experience not required. Pressing foot brake flashes bright red light. Stop in rear. Territory allowed. 1301 Berger Bldg., Pittsburgh, Pa.

"CALIFORNIA Buckskin Garment Mender" repairs clothing without thread. Housewives delighted. Enthusiastic agents coining money. Splendid sideline. Attractive proposition and sample package free. Address, Norman Ovri, East San Diego, Calif.

SPLENDID "Side" — Easy seller — Big profits. Combined Bills Payable, Sales and Cash Ledger. Pershing Mfg. Co., South Bend, Ind.

BE Independent, learn to make Perfumes and Toilet Articles. Big profit. Commercial Laboratory, 70 So. Second, Memphis, Tenn.

AGENTS Wanted—Presto Puncher. Household necessity. Circular free. The Idea Factory, Shreveport, La.

MONEY in mail order business. Names of 30 supply houses 10c. Pennell Company, Covington, Ky.

A BIG seller: Soxneed Hose Supporters. No Elastic. Send 25c for Sample and Proposition. Soxneed Company, 856 Pacific Bldg., San Francisco.

AGENTS: Something new. Write quick for particulars. F. O. Spaulding, Fairfield, Maine.

PORTRAIT men and agents, get acquainted. How is this? No extra charge for extra heads, figures, tritones, artotos, pastels or sepias, in our A and B grades. Frames, luminous goods, medallions, photo pillow tops. Credit given. Rejects credited. Write today. Portrait Supply Co., 308 S. Kilbourn, Chicago, Ill.

OFFICE Necessity. Typists buy on sight. Cost 30c; sell 50c. Frost, 435 East [illegible] St., Cleveland, Ohio.

AGENTS: Reversible Raincoat. Two coats in one. One side dress coat, other side storm overcoat. Guaranteed waterproof or money back. Not sold in stores. Big commission. Sample furnished. Parker Mfg. Co., [illegible] St., Dayton, Ohio.

AGENTS—90c an hour to advertise and distribute samples to consumer. Write quick for territory and particulars. Albert Mills, Gen. Mgr., 5160 American Bldg., Cincinnati, Ohio.

AGENTS—New Invention. Harper's Ten-in-One Brush Set and Fibre Broom. It sweeps, washes and dries upstairs windows, scrubs and mops floors and does five other things. Big profits; easy seller. Free trial offer. Harper Brush Works, Dept. X, Fairfield, Iowa.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages secured. Novelty Cutlery Co., 67 Bar St., Canton, O.

AGENTS—Splendid proposition to sell Lubricating Oils and kindred products. List also includes Prepared Paints, Roofing, Roof Coating, Belting, etc. This is no shoddy proposition. Pay Weekly. Get our proposition. Doty Company, Station A, Cleveland, Ohio.

MONEY-MAKING Mail Order Plan given free. "Mailpress," 2818-T, Congress, Chicago.

AGENTS coin money selling Cramer Fibre Brooms. Sample postpaid $1.00. Also Sanitary Brushes. Fred S. Cramer Mfg. Co., Wichita, Kan.

LIVE Wires Wanted to sell theft-proof suit-lock. Liberal profits. Serlin & Co., 2732 Woodward Ave., Detroit, Mich.

GOLD Leaf Sign Letters; make and sell; profits exceed 1,000%; immense demand; particulars free. Johnston Co., Quincy, Ill.

NEW accessory fits any auto; useful at home. Sample 25c. Melvin E. Hill, Los Angeles, Calif.

COIN Money Selling Neverwet Shoulder Strap Waterproof Aprons. Every woman buys. Best on market. We manufacture and ship direct. Get details today. A. D. Bergen Manufacturing Company, 413 Locust St., Philadelphia.

SELL Saviquin Shampoo. Large profits; a household necessity. Send for particulars. Sample 25c. Knox Chemical Co., Dept. A, Rockland, Maine.

COPPER Pots, all sizes, also anything in copper goods desired. Write today for Free catalog. Boyer & Co., 509 Reserve Block Bldg., Omaha, Nebr.

AGENTS' Magazine contains many opportunities; three months, 25c, including directory leading supply houses. Harvey Teeple, Decatur, Ind.

"BRILLIANT Dust" and "Cheerlette," fastest selling products known. Particulars free. Samples 25c each. Gem Mfg. Co., Kittanning, Pa.

BIG money made silvering mirrors and plating tableware. Outfits furnished. E. Deole Laboratories, 286 Fifth Avenue, New York.

MAKE Money at home making toys—we show you how. Send 50c (no stamps) for complete working drawings and instructions. Dekalb Designing Co., Decatur, Ga.

"PEERLESS" Plate Glass Wind Deflectors give every car that "million-dollar" look. Most popular necessity ever invented. Handsome. Durable. Quickly demonstrated and attached. A fortune for live agents. Write Quick for liberal trial offer and illustrated booklet. Rapid Sales Corporation, 20-A, Grand Rapids, Mich.

AGENTS Coining Money selling Universal Gas Savers for every gas stove. Wonderful heat. Cuts gas bills in half. Increases heat. Popular prices. 100% profit. Exclusive territory. Write quick. B. C. Moore, Gas Saver Company, Topeka, Kansas.

AGENTS—Sell Tyler's Ideal Fibre Cutter, the most useful household article made. Makes tough steak as tender as porterhouse and performs a dozen other kitchen duties. Address M. H. Tyler Mfg. Co., Dept. S2, Muncie, Ind.

ANY man handy with paint brush can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marui Company, Tribune Bldg., New York, N. Y.

SELL washing tablets that are different. They work quicker, sell easier and at a greater profit. Get our proposition. Write Newton & Co., 1 Main St., Newark, N. Y.

EVERY woman needs toilet and household preparations every day. Build big profitable repeat business with our superior products. Colonial Chemical Co., 631A Penn Ave., Pittsburgh, Pa.

WRITE for particulars; best article ever offered men; costs 5c, sells quick for dollar; $15 daily; sworn statement. Beach, 22 Express Blk., San Diego, Cal.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

AGENTS Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration—car owners, homes, factories, stores practically buy on sight. Our men make $10 to $50 a day—exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fyr-Fyter Co., 103 Fyr-Fyter Bldg., Dayton, Ohio.

AGENTS make 140% profit. Iradium (luminous) crucifix shines in the dark. Sells for $2.00. Costs 84c. Complete line religious articles, crucifixes, bulbs, switch plates, house numbers and match boxes. Novel! Ornamental! Useful! Every home a prospect. Big sales. Get free demonstrating outfit. The Pioneer Corporation, 1259 W. 63d St., Chicago, Ill.

BEES pay if kept right. Be a progressive beekeeper. We can show you how. Send $1.00 today for Bee Primer, 9 months subscription to American Bee Journal and catalogues of bee supplies. American Bee Journal, Box 62, Hamilton, Ill.

WE want men and women who are desirous of making $25.00 to $200.00 per week clear profit from the start in a permanent business of their own. Mitchell's Magic Marvel Washing Compound washes clothes spotlessly clean in ten to fifteen minutes. One hundred other uses in every home. Nothing else like it. Nature's mightiest cleanser. Contains no lye, lime, acid or wax. Fastest selling article ever sold through agents. Free samples make sales easy. Enormous repeat orders; 300% profit. Exclusive territory. We guarantee sale of every package. No capital or experience required. Baker, Ohio, made $600 last month. You can do as well. Send for Free Sample and proof. L. Mitchell & Co., Desk 300, 1308-1314 E. 61st St., Chicago, Ill.

SELL Necessities. Everybody needs and buys the "Business Guide." Bryant cleared $800.00 in July. Send for sample. It's free. Nichols Co., Box 4-B, Naperville, Ill.

GALLAGHER made $336.00 in one week selling guaranteed Collection Systems, used by all business men. Sayers Cabinet Mfg. Co., 2801 Sheffield Ave., Chicago, Ill.

GOLD Sign letters for stores and office windows. Photo pillow tops, portraits, frames, sheet pictures, medallions, waterproof aprons, novelties. Samples, catalogue free. Thirty days' credit. James C. Bailey Co., Desk B11, Chicago, Ill.

MAKE 200% profit selling Eco-Blue—the housewife's friend. Wonderful seller. No experience required. Agents make $5 day in spare time. L. L. Buttery, Cuero, Texas.

AGENTS, Canvassers, sell Verdina Face Powder and Toilet Necessities. Big profits. Permanent repeat business. Highest quality. Lowest prices. National Products Co., A16 E. 13th St., New York.

AGENTS: Empire Tire Repair. 40 punctures repaired for $1.00. Five minutes service. 110% profit. Sell everybody. Sample free. Parker Mfg. Co., 178 Bark St., Dayton, Ohio.

BEAUTIFUL new map of United States showing all transcontinental highways. Profit large. Send for particulars. Standard Map Company, 129 W. Ohio Street, Chicago.

SALESMEN and District Managers for tremendously successful new office article. Two minute demonstration means sale every office; 100% repeater. A gold mine for you. Perfection Mfg., 113 South Fourth, Philadelphia, Pa.

AGENTS to sell Kerosene Burners for all purposes. Big Profits. Economy Mfg. Co., 616 W. Monroe St., Chicago.

AGENTS, $60 to $200 a Week. Free Samples. Gold Sign Letters for Store and Office windows. Anyone can do it. Big demand. Liberal offer to general agents. Metallic Letter Co., 431-E N. Clark St., Chicago.

$30.75 PROFIT on $2.50 outfit; gold initials for automobiles, etc. Write National, Station D, Brooklyn, N. Y.

YOU'LL be surprised! Jazz Sport Silk Handkerchiefs; miniature pair lady's silk bloomers worn as a handkerchief. Fool your friends. Causes a laugh every minute. Sample 50c prepaid, or combination set of two costs $1. Good proposition for live agents. Gustave W. Cohen & Bro., Dept. 37, 744 Broadway, New York.

AGENTS: Self-Threading Needles. Every home buys. 175% profit. Sample Free. Address A. Maher Co., Dover, N. J.

BE Successful Agent—Free sample outfit worth $2.25. "Quality" beauty preparations. Make big money. Extensive line. Established 50 years. Lynas Co., 216, Logansport, Ind.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 618 Main, Richmond, Va.

AGENTS, Big Profits. Gold Sign Letters, easily applied. Best and cheapest manufactured. Samples free. Interstate Sign, Dept. C, 2820 N. Halsted St., Chicago.

SIGN letters for windows at honest prices. Genuine gold leaf. $50 week easily made. Chicago Sign System F, 150 W. Austin Ave., Chicago.

AGENTS make 500% profit handling Auto Monograms, New Pictures, Window Letters, Transfer Flags, Novelty Signs. Catalog Free. Write Hinton Co., Star City, Ind.

$1,000 PER Man per County—Strange invention startles world. Agents amazed. Ten inexperienced men divide $40,000. Korstad, a farmer, did $2,200 in 14 days. Schleicher, a minister, $105 first 12 hours. $1,200 cold cash made, paid, banked by Stoneman in 30 days; $15,000 to date. A hot or cold running water bath equipment for any home at only $7.50; self-heating; no plumbing of water works required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 631 Allen Bldg., Toledo, Ohio.

AGENTS: Men and women, in spare or full time, make big money selling household necessity. Every home a prospect. Quick sales, big profit. Territory open. Write for particulars. Judd & Leland Manufacturing Company, Box 21, Clifton Springs, N. Y.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

MAKE $100 Weekly Selling Rolly's Washday Wonder. New Chemical Dirt Solvent. Harmless. Cleans without rubbing. Want Agents and Crew Managers. Free Samples and Particulars. Rolly Chemical Co., A1, Hastings, Neb.

STOP Making Money for Others. Manufacture These Goods Yourself From Miller's Guaranteed Manufacturer's Formulas—Profits Enormous. Investment Small. Business Quickly Established—Stamp Brings Valuable Literature Regarding Magico Windshield Cloths; Amazon Rubber Repair Launderite; Stovoil, Bluing Paddles, Mexican Yucca Soap, Food, Automobile, Household Specalities in all lines. Get this Valuable Literature. Miller Chemist (Old Reliable, Established 1897), Tampa, Florida.

AGENTS! A sale in every home for our beautiful Dress Goods, Silks and General Yard Goods. Quick sales! Big profits! Large book of 1000 sample fabrics free to agents. Write today. National Importing & Mfg. Co., Dept. 6X, 573 Broadway, New York, N. Y.

LARGE shirt manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. Free samples. Madison Mills, 503 Broadway, New York.

MAKE 600% Profit, Free Samples, Lowest priced Gold window letters for stores, offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline. Acme Letter Co., 2806-D, Congress, Chicago.

AMERICO Booster auxiliary water carburetor makes autos burn water. Eliminates carbon. Low cost; liberal profits; details free. Americo Co., Dept. 178, Cincinnati, Ohio.

AGENTS: Big Money Monogramming By Transfer Method. Catalogue Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

SELL Pudding Powders—Delicious dessert. Fast sellers; quick repeaters; big profit. Send for terms and sample. C. H. Stuart Co., 65 Union, Newark, New York.

AGENTS make one dollar per hour selling "De Luxe Art Panels." Newest thing in art. Men with automobile make forty dollars per day. Tremendous demand. Write for samples and expense money. Consolidated Portrait Co., 225 North Green St., Chicago.

$200 WEEKLY. Free samples. Sell gold sign letters to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Acme Letter Co., 2800D Congress, Chicago.

MAKE $25 to $50 Week representing Clows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clows Company, Desk 31, Philadelphia, Pa.

YOU can letter Automobiles, Doors, Trunks etc., without any previous experience by Transfer Process. Make $27.50 on $2.50 Outfit. Auto Monogram Supply Co., 16 Green St., Newark, N. J.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 160 N. Wells, Chicago.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business. Write for free samples, showing finishes, etc. Gunmetal Co., Ave. H, Decatur, Ill.

AGENTS and portrait men. Crew managers. We give you more for your money. Better and quicker service. Lowest prices on frames and glass. Rejects credited. Catalog free. The Pioneer Corporation, 1259-A West 63rd St., Chicago.

LIVE Agents make $10 Day selling Eureka Strainer and Splash Preventer for every water faucet. Takes on sight. Widely advertised and known. Get details today. A. B. Seed Filter Company, 73 Franklin, New York.

FAST-SELLING Sanitary Brushes, Mops, Dusters. Positively best house-to-house line in America. Write and be convinced. Sanford Brush Co., 544 W. Lake St., Chicago.

AGENTS Make $10 a day selling Presurown Trouser presser and creaser. Connolly, 176 Greenwich St., N. Y.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., 201 Olive, St. Louis.

GET permanent customers for Guaranteed Hosiery and Underwear easy by our new Sure Success Plan. Quickest introducer ever—opens way to $10-$20 a day profits. Beautiful sample outfits—liberal commissions, prompt deliveries. Wonderful opportunity. Write quick. C & D Company, Section D, Grand Rapids, Mich.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrite Co., 1115 Second Ave., New York.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

MAKE $2 an Hour. Article that removes iron rust, grass, medicine, fruit, mildew stains. Cleans Panama and Straw Hats. Bleaches clothes. Sells Every home. Write for free demonstrating outfit and start taking orders at once. Christy, 81A Union, Newark, N. Y.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, Calif.

AGENTS make $50 weekly selling our Handy Household Articles; particulars free. Scheff Co., 2248 West North Ave., Chicago.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-5, 57 E. 18th St., Chicago, Ill.

AGENTS—New patented curtain rod, necessity in every home; big profit; 4 to 10 sales at every house. Write for free sample. Home Curtain Rod Co., Providence, R. I.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission Bead Co., PM-2819, West Pico, Los Angeles.

AGENTS make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

AGENTS—Advertising Pencils, ready sellers, excellent sideline. Write for proposition. North American Pencil Works, 501 Plymouth Court, Chicago.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

WANTED—Tailoring Sales Agent—Make big money from very start—$60.00 to $75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred woolens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars, giving your experience as salesman or tailor's sales agent. H. F. Foster, Sales Manager, Lock Box 483, Chicago.

AGENTS—Best seller: Jem Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

AGENTS—If you are making less than $300 a month our proposition on Sentinel Burglar Alarms for windows and doors will interest you. Many agents earn $20 daily. Brand new inventions. No wires, batteries or nails. Instantly attached to any door or window. Handsomely nickel plated. Sell on sight. No competition. Provides cheap burglar insurance. Big money makers. Write today for extremely liberal terms to agents. Sentinel Alarm Co., 140 S. Dearborn St., Chicago, Ill.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 25c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

MOST Wonderful Seller. 96c profit every dollar. No stock to carry. License unnecessary. Sample free. Mission Bead Co., 1617 Irola, Los Angeles, Calif.

POLMET Polishing Cloth cleans all metals. Retails 25 cents. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

BIG money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS—We want men and women to become district and State representatives. For full particulars write Mazon Corporation, Box P-613, Waterloo, Iowa.

THE "Dilver," a new kitchen specialty—endorsed by Good Housekeeping Institute—fills a long felt need in every home. Will pay for itself every six months by saving food, time, work and worry. Will last for years. No competition. Not sold through stores. Opportunity for advancement. Give brief history of your experience, territory desired, lines now handled, if any, etc. This will eliminate undue correspondence and give quick action. Dilver Manufacturing Company, Park Bldg., Pittsburgh, Pa.

START in a permanent business of your own selling guaranteed Hosiery and Underwear direct from mills. No capital or experience is needed; many representatives make $3,000 to $5,000 per year. Become our district manager—get others working for you. Write for details to Malloch Knitting Mills, 5112 Grant St., Grand Rapids, Mich.

AGENTS sell Laundry Tablets under your own name and brand. Free samples and circulars furnished with every order. Particulars free; sample, fifteen cents. Write today. Krebs A Products, College Point, N. Y.

"RADIO" Luminous Paint—Makes any article visible in the dark. Guaranteed. Bottle 50c coin. Illuminant Company, 5428KB Rice Street, Chicago.

AGENTS—Elgin watches at wholesale. Proctor Co., 6909 Wentworth, Chicago.

HIGH-GRADE SALESMEN WANTED

ACCEPT this offer if you want real money. Sweet made $652 last month. Murphy $636. Largest company of its kind in America. Your profit $3 to $8 per order. We furnish full equipment. All you do is call on our customers and take their orders for famous all-weather coats. Big, permanent proposition. Spare time or full time. No capital required. Write quick for offer that will put you on the road to success. The Comer Mfg. Co., Dept. W-53, Dayton, Ohio.

TERRITORIAL Sales Manager Wanted. Look at the signboards in your neighborhood! Who sold them? Who made money on them? Correspondence is invited by General Highways System, Inc., from big-earning salesmen or sales managers, able to handle a territory as executive head. Some very choice territory is open, so quick action necessary. Highly profitable commission basis for big-time work. Write, confidentially, your references, qualifications, etc. Address General Highways System, Inc., 1027 W. Van Buren Street, Chicago, Ill.

SALESMEN with car. Exclusive territory for patented Universal Toolholder; eliminates all the special toolholders. Sells on sight to every machine repair shop and factories of every kind. Immense profit on small capital. Write for particulars. Universal Toolholder Co., 528 E. 79th St., New York.

SALESMEN Wanted—Local or traveling, part or full time, to sell calendars, fans, fly swatters, brushes, rulers, etc. Over two hundred stock designs of paraffin signs, ink cards, etc., for all merchants. Fine side line, liberal commission. The Harrison Company, Union City, Ind.

LEARN the secrets of Star Salesmanship and qualify for $3,000 to $10,000 a year as City or Traveling Salesman. Free Employment Service. Send now for free book about our amazing system, also list of lines. National Salesmen's Training Association, Dept. 128-W, Chicago, Ill.

SAVE Coal—Steam Radiators filled with air can't radiate heat. Leskole Air Valves automatically release the air, admitting, with less steam, all the heat your coal produces. Guaranteed, $1.75. Happy agents wanted. Leskole Air Valve Co., 42 Broadway, New York.

AN Excellent side line for men or women calling on general dry-goods, variety, notion and drug-store trade. Meritorious article, rapid seller and repeater. Big commission. Pocket samples. Magnetic Mfg. Co., 519 Corn Exchange, Minneapolis, Minn.

SALESMEN: Make extra money easily. Sell our Accident and Sickness policies in your spare time. $5,000 death, $25 weekly benefit for $10 yearly. Address North American Accident Ins. Co., Dept. K-24, Newark, N. J.

FREE Sample of quick-selling patented specialty. Live Wire Salesmen, get yours now. Also details of wonderful $5,000 year opportunity. Agents wanted everywhere. H. G. Martin, 51 Cliff St., New York City.

SOMETHING different; all business and professional men need it. Sells $7.50, costs $1.50. Big repeater. Sample free. Especially good proposition for state managers. Merchants Assn., Minneapolis, Minn.

BIG Profits Easy. Duplex Transformers needed on every auto. Save gas. Easily sold. Exclusive Distributors wanted. Jubilee Mfg. Co., 12 Sta. C, Omaha, Nebr.

OIL Gauge for Fords. Remarkable new invention. Sells on sight. Big profits easy. Exclusive distributors wanted. Address Sales Mgr., Sta. C, Omaha, Nebr.

SIDE line salesmen: Easy selling line work pants. Advertised. Light samples. Exclusive. Big money maker. Daniel Boone Woolen Mills, 1735 Diversey, Chicago.

SALESMEN: Sell Porcelain Cleaning Compound to Retailers to be shipped through Wholesalers. Write for proposition. Ace Mfg. Co., Portland, Me.

VENDING Machines—Peanut, Match and Gum Venders. Excellent Line—Big Commission. Standard Adv. & Printing Company, Ft. Scott, Kans.

SALESMEN for Mundell Air Cushion Pneumatic Innertube for automobiles. Mundell & Sons, 1459 West 69th St., Chicago.

57 MILES per gallon made with new patented gasoline Vaporizer. Write for particulars. Vaporizer Co., Pukwana, S. Dak.

BIG money selling Christmas show cards; every store buys. You make 100%; write for particulars. Nelson, 353 N. State, Chicago.

1000% ON your investment. One sale a day means over $225 per month. We have salesmen who make 50 sales a week. They net over $12,000 a year selling our nationally advertised, fully guaranteed range, heater and furnace, oil-gas burner. We want one thousand more salesmen capable of delivering the goods, to sell the Vapor Gas Burner, the best oil-gas Burner on the market. Success guaranteed. Sales plans and selling equipment furnished free. Open territory must be allotted. Write now and begin earning big money. The Vapor Gas Burner Company, Desk No. 1, Columbus, Ohio.

WONDERFUL Winter Auto Necessity invented. $1.00 Sale means 75 cents profit for you. Experience unnecessary. Absolutely new specialty. Riley made $108 three days. Slocum first hour made $10. Every Automobilist buys after each quick demonstration. Carried in pocket. Prevents accidents. Better service. Reduces operating and repair expenses. Write quick for exclusive territory and free sample. Secretary, Box 494, Hartford, Conn.

WANTED—Salesmen now calling on Toilet Goods, Hardware, House Furnishing, Tobacco and Infants' Wear Trades to handle our different specialties—liberal commission—good territories open. E. T. Gilbert Mfg. Co., 246 South Ave., Rochester, N. Y.

SHOE Lace Fastener. Men, Women, Children. Neat, attachable by purchaser, appealing to all seeing on salesman's shoe. Sample 25c. Jiffy-Style, Sacramento, Calif.

$660.00 ONE day's profit; Bruce made it with our amazing seller. Salesmen wanted everywhere; fortune in it for hustlers. Empire Products, 1539 Chestnut, Philadelphia.

WANTED—Capable salesman to market fast selling automobile accessory. Unlimited sales during winter—exclusive territory—large profits for energetic men. Address Monroe Manufacturing Co., Box 1144, Mobile, Ala.

EVERYBODY Eats Every Day. You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee, and entire line of groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

WANTED At Once: Salesmen to sell R. A. G. Products. Others are making from $25 to $50 weekly. Why not you? Write for particulars. The R. A. G. Product Co., Dept. A, 25 Purchase Street, Fall River, Mass.

SALESMEN for Patented Cigar Lighters and Cigar Case Moisteners. Sell to Cigar Stands everywhere. Thousands in use. Exclusive or side line. Start Now. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

SALESMEN can make $5.00 a day selling our Pencils, Signs, Aluminum and Celluloid Advertising Novelties, Yard Sticks, Whistles, etc. Liberal terms. Sells entire year. Fine side lines. Local and traveling Agencies. Model Calendar Co., Dept. 226, South Bend, Ind.

MAKE $50 Daily. Something New! 400% Profit. All Business, Professional Men Need It. Sells $5. Costs $1. Brooks, Texas, sold 20 first day, profit $80. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit Free. Federal Association, 71-D Asylum St., Hartford, Conn.

ASKO Salesmen to sell Auto Accessory as side line; can carry sample in vest pocket; sells on sight; big commission. Allen Specialty Co., 2721 W. Lake St., Chicago.

BATTERY salesmen to sell the Sterling Unit-Cell Storage and Lighting Batteries. Apply The Sterling Storage Battery Co., Inc., Schenectady, N. Y.

SALESMEN Wanted—To sell, as side-line, novelties that sell. Good commission. Reliable manufacturers. Quality goods. Bradford & Co., Inc., St. Joseph, Mich.

AGENTS, $60 to $200 a Week. Free Samples. Gold Sign Letters for Store and Office windows. Anyone can do it. Big demand. Liberal offer to general agents. Metallic Letter Co., 431C N. Clark St., Chicago.

SALESMEN—Boiler-room specialties, large field, attractive proposition. Armstrong Manufacturing Company, Springfield, Ohio.

$300 PER Month and bonus guaranteed salesmen successfully demonstrating wonderful new adding machine. Retails $15.00. Work equals $350 machine. Genuine opportunity. Full time or side-line. Lightning Calculator Co., Dept. G, Grand Rapids, Mich.

57 MILES per gallon made with new patented gasoline vaporizer. Write for particulars. Stransky Vaporizer Co., Pukwana, S. D.

HELP WANTED

MEN to represent corporation by interviewing business men at home or traveling. Nothing to sell. Equipment furnished you free. Earnings from $2,000 to $9,000 yearly. Opportunity. 3509 White Plains Avenue, New York.

GOVERNMENT Wants Railway Mail Clerks. Salary $135 month. Experience unnecessary. Write for free information concerning position and instruction. Columbia School of Civil Service, 411 Pope Bldg., Washington, D. C.

MEN Wanted—To Prepare for Designing and Drafting positions. Excellent opportunity. National Instrument Company, 4704 North Hamilton Ave., Chicago.

GOVERNMENT needs Railway Mail Clerks, $133 to $192 month. Write for free specimen questions. Columbus Institute, Columbus, Ohio.

FIREMEN, Brakemen, Baggagemen, $140-$200; Colored Porters by Railroads everywhere. Experience unnecessary. 810 Ry. Bureau, East St. Louis, Ill.

RAILWAY Mail Clerks wanted. Commence $135 month. Sample examination questions free. Franklin Institute, Dept. T-21, Rochester, N. Y.

CAPABLE Salespeople (Both Sexes) Wanted in unique new enterprise to gather local lists of prospects and then co-operate with us in creating sales leading to large daily profits. Write quick for particulars. Biddle Business Publications, Suite K, 19 West 44th Street, New York City.

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$40 WEEK. Become Automobile Experts. Learn while earning. Sample lessons free. Franklin Institute, Dept. S-401, Rochester, N. Y.

BIG money made silvering mirrors and plating tableware. Outfits furnished. E. Decie Laboratories, 286 Fifth Avenue, New York.

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TOY Salesmen. Factory direct. Samples 60c or $1.25. Noro Manufacturing Co., Peoria, Ill., Dept. S.

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PHOTOPLAYS in demand. Make extra money. We show you how. Details free. Rex Publishers, Box 208, H205, Chicago.

MEN—Women desiring railway mail and govt. clerk-carrier positions. Write for list positions and free particulars of examinations. Mokane Institute, 177, Denver, Colo.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522, Hannibal, Mo.

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GOVERNMENT Positions are Fine: $1400, $1600, $1800 at start, up to $2300 and $2600. Exams everywhere. Write today for full information. Patterson Civil Service School, Box I, Rochester, N. Y.

INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 620 F, Washington, D. C.

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. Slann Sign System, St. Antoine St., Detroit, Mich.

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PATENT ATTORNEYS

PATENTS—Herbert Jenner, patent attorney and mechanical expert, 622 F St., Washington, D. C. I report if a patent can be had and its exact cost. Send for circular.

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INVENTORS—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information free. Lancaster and Allwine, 221 Ouray Bldg., Washington, D. C.

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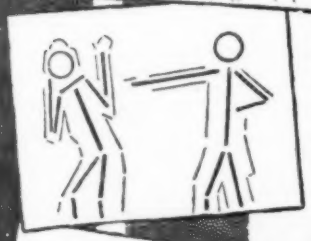

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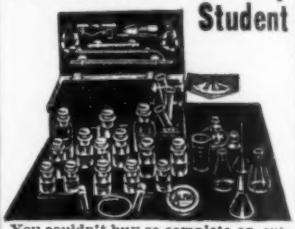

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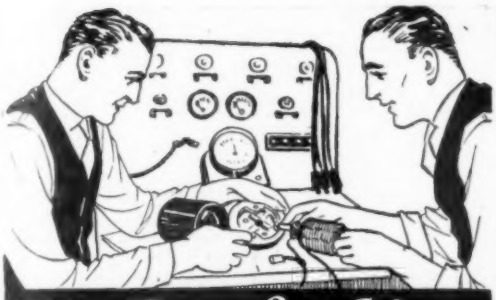

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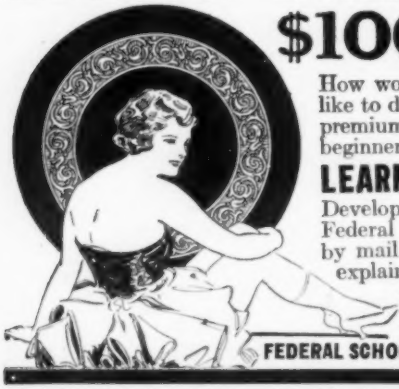

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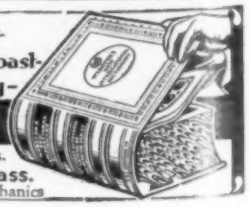

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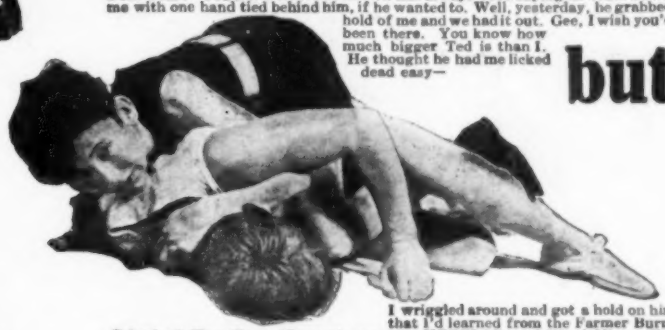

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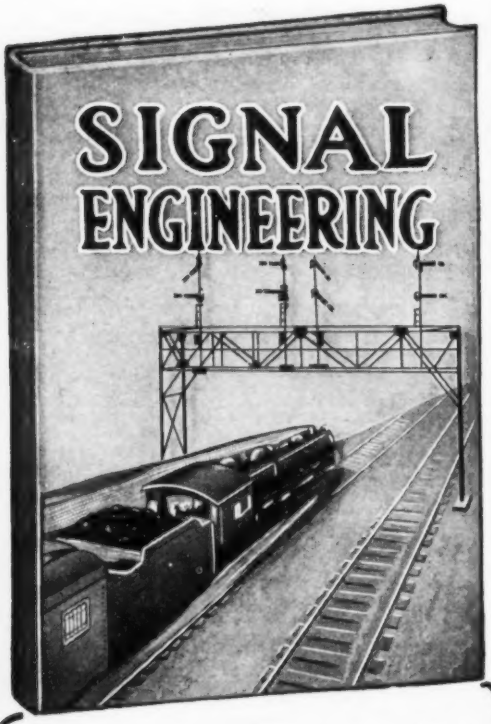

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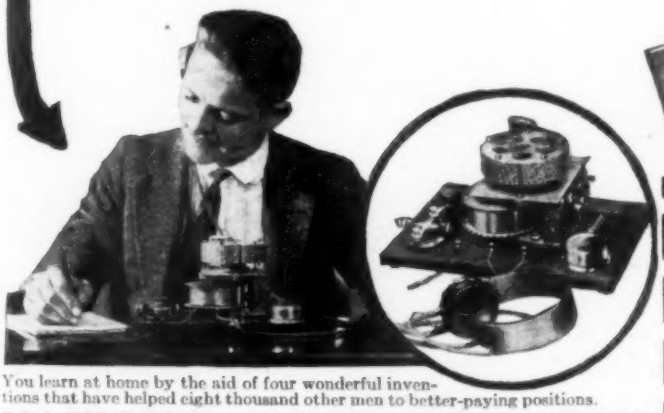

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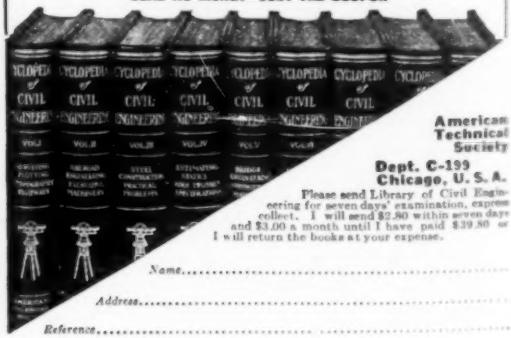

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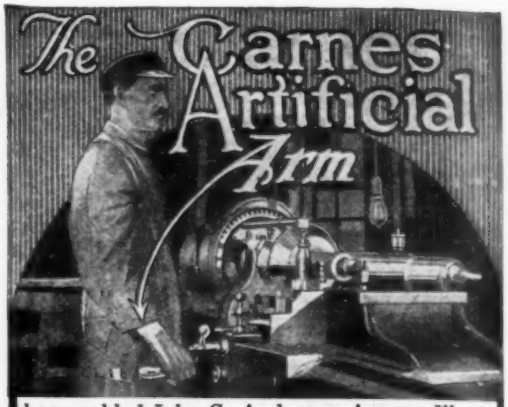

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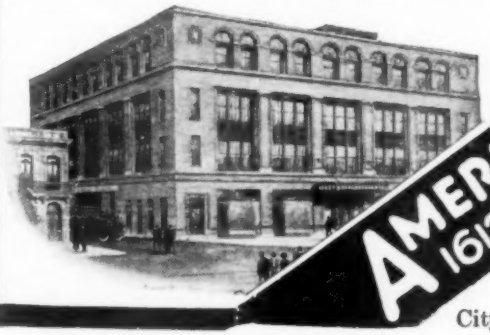

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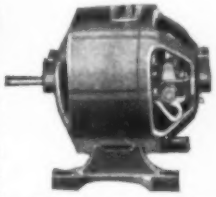

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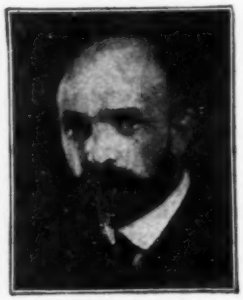

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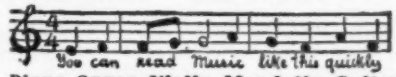

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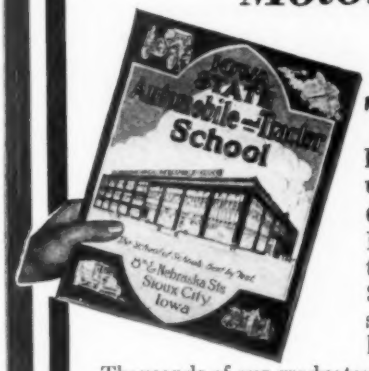

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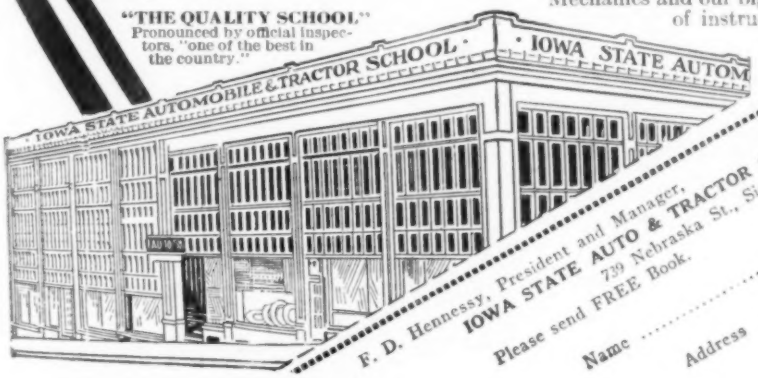

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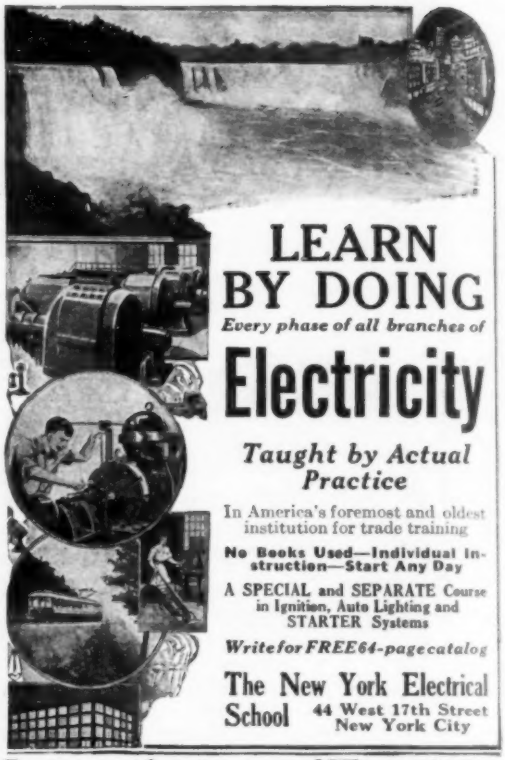

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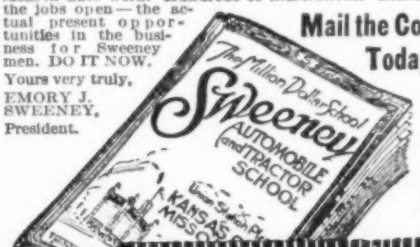

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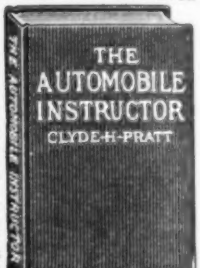

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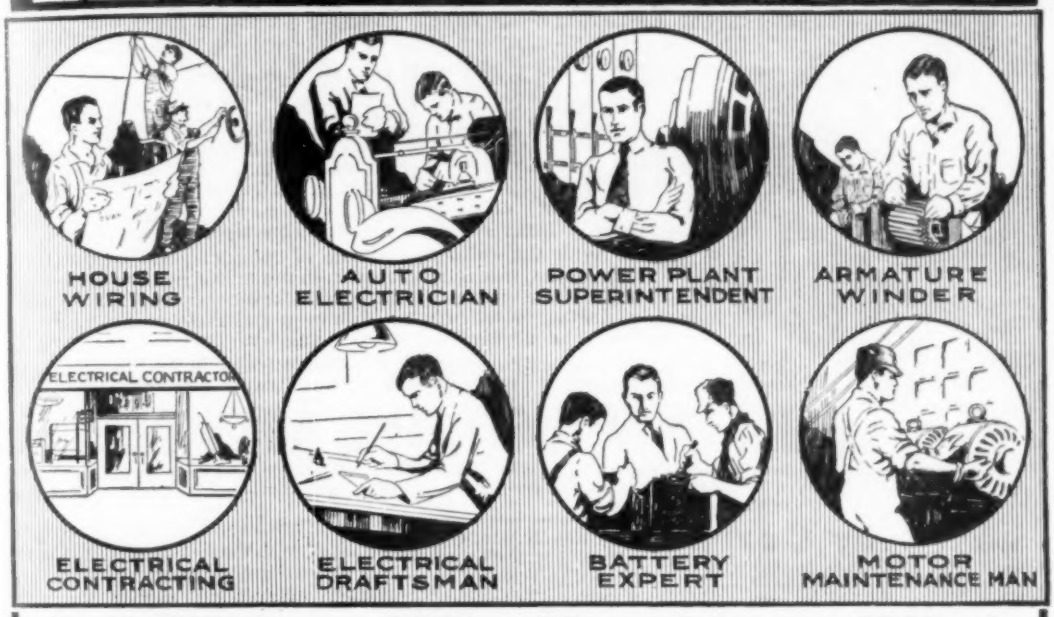

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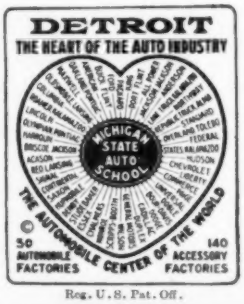

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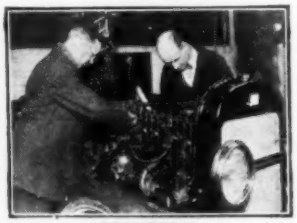

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(Three months after graduating from the M.S.A.S.)

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"I thank the M. S. A. S. for the great start it gave me.

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The Opportunities are Actually Unlimited in Every One of These Lines

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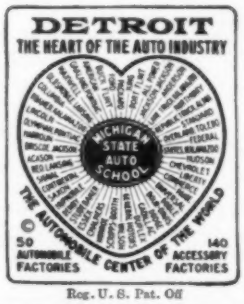

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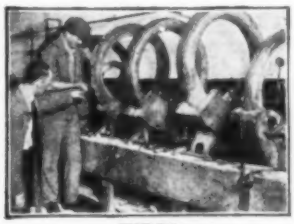

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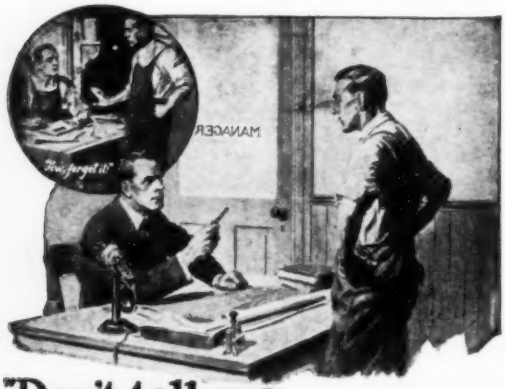

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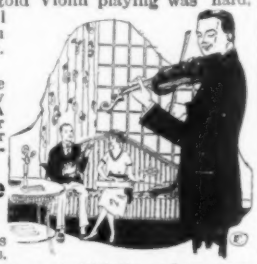

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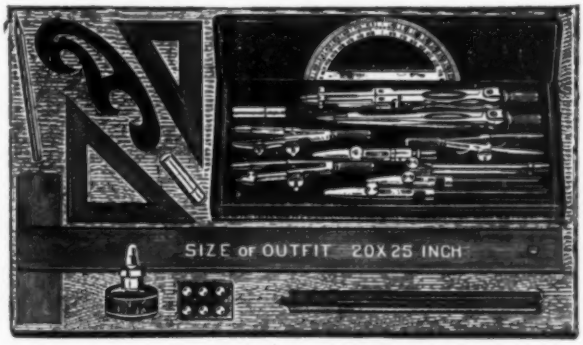

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Men's Sport Watch
Non-inflammable and unbreakable glass
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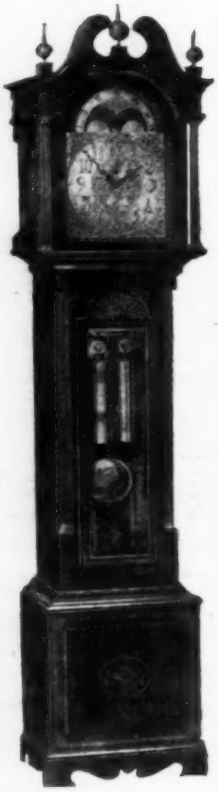

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Reduced Price On This

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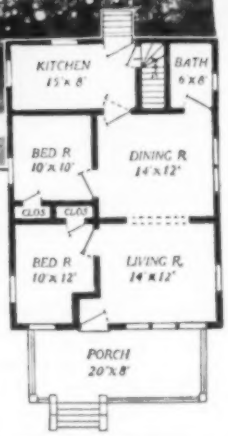

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Democracy

"—of the people, by the people, for the people"

People of every walk of life, in every state in the Union, are represented in the ownership of the Bell Telephone System. People from every class of telephone users, members of every trade, profession and business, as well as thousands of trust funds, are partners in this greatest investment democracy which is made up of the more than 175,000 stockholders of the American Telephone and Telegraph Company.

If this great body of people clasped hands they would form a line more than 150 miles long. Marching by your door, it would take more than 48 hours of ceaseless tramping for the line to pass.

This democracy of Bell telephone owners is greater in number than the entire population of one of our states; and more than half of its owners are women.

There is one Bell telephone shareholder for every 34 telephone subscribers. No other great industry has so democratic a distribution of its shares; no other industry is so completely owned by the people it serves. In the truest sense, the Bell System is an organization "of the people, by the people, for the people."

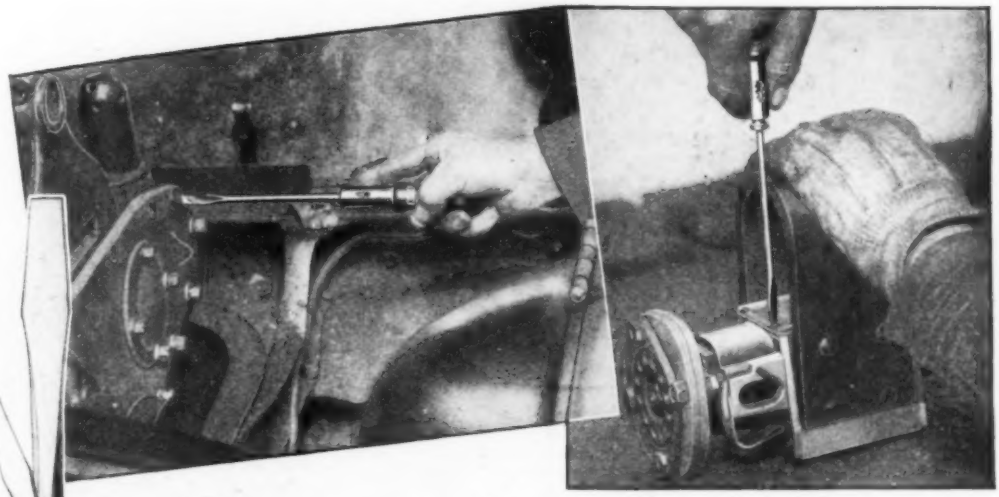
It is, therefore, not surprising that the Bell System gives the best and cheapest telephone service to be found anywhere in the world.

"BELL SYSTEM"

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

AND ASSOCIATED COMPANIES

One Policy, One System, Universal Service, and all directed toward Better Service



"They save my time and muscle"

"With a 'Yankee' Ratchet Screw-driver I simply grasp the handle and turn to and fro.

"I don't suffer from muscle-fag, since I don't have to change my grip at every turn of the screw. I can drive more screws; and drive them faster too.

"'Yankee' Ratchet Screw-drivers stand up. They are strong, well made tools—mechanically right."

No. 10 and No. 15 have three adjustments—right-hand ratchet, left-hand ratchet, and rigid. All blades are made of the best cast steel properly tempered, ground, polished and tested.

No. 10 is made in 2, 3, 4, 5, 6, 8, 10 and 12 in. blades. No. 11 is the same as No. 10 except that the ratchet shifter moves across the blade instead of parallel to it.

No. 15 has a handy, knurled washer at the base of the blade (see illustration) for starting small, wobbly screws with thumb and forefinger while the hand steadies the driver. Made in 2, 3, 4, 5, 6, and 8 in. blades. All blades $\frac{5}{16}$ in. diameter.

Some other "YANKEE" Tools

Spiral Screw-drivers	Ratchet Hand Drills
Quick Return Spiral Screw-drivers	Ratchet Bench Drills
Plain Screw-drivers, $1\frac{1}{2}$ to 30 in. blades	Ratchet Chain Drills
Ratchet Breast Drills	Ratchet Tap Wrenches
	Automatic Push Drills
	Bench Vises, removable bases

Dealers everywhere sell "YANKEE" Tools

This Interesting Book FREE

Contains numerous illustrations. Shows jobs being done without tearing down. Shows "Yankee" Tools doing things that other tools cannot do.

Write today for it

NORTH BROS. MFG. CO., Philadelphia

"YANKEE" TOOLS

Make Better Mechanics

Waterman's
Ideal
Fountain Pen
The
Appreciated Present
Waterman's Ideal Fountain Pen
THE world-wide reputation of Waterman's Ideal Fountain Pen suggests it as the perfect present for every member of the family.
In addition to pride of possession, it brings with it years of faithful service that endear it more and more each year.
Three Types: Regular Safety Self-filling
with a choice of natural iridium pointed gold nibs to fit any individual pen preference.
$2.50 to $250
Selection and Service at Best Dealers the World Over
The quality standard in all Waterman's Ideal Fountain Pens is the same. The difference in prices is determined by size or ornamentation.
L.E. Waterman Company
191 Broadway, New York
129 So. State St., Chicago
24 School Street Boston
17 Stockton St. San Francisco
CLIP-CAP

You Will See

Prettier teeth—safer teeth—in a week

We will send for the asking a new method tooth paste. Modern authorities advise it. Leading dentists everywhere now urge its daily use.

To millions of people it has brought whiter, safer, cleaner teeth. It will bring them to you and yours. See and feel the delightful results and judge what they mean to you.

Removes the film

It removes the film — the viscous film you feel. No old method ever did that effectively.

Film clings to teeth, gets between the teeth and stays. It dims the teeth and leads to attacks on them. It is the cause of most tooth troubles. Those troubles have been constantly increasing, because old methods failed to combat film effectively.

Film absorbs stains, making the teeth look dingy. Film is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Germs breed by millions in it. They, with tartar, are the chief cause of pyorrhea. Also of internal troubles.

Ways to combat it

Dental science has now found two effective film combatants. Able authorities have amply proved them. Now dentists the world over are urging their adoption.

These methods are combined in a dentifrice called Pepsodent — a tooth paste which meets every modern requirement. And a ten-day test is now supplied to everyone who asks.

These effects will delight you

Pepsodent removes the film. Then it leaves teeth highly polished, so film less easily adheres.

It also multiplies the salivary flow — Nature's great tooth-protecting agent. It multiplies the starch digestant in the saliva—the factor which digests starch deposits that cling. It multiplies the alkalinity of the saliva—the factor which neutralizes acids.

Every application brings these five effects. The film is combated, Nature's forces are multiplied. The benefits are quickly apparent.

Send the coupon for a 10-Day Tube. Note how clean the teeth feel after using. Mark the absence of the viscous film. See how teeth whiten as the film-coats disappear.

Compare the new way with the old, then decide for yourself which is best. Cut out the coupon now. This is too important to forget.

Pepsodent PAT. OFF. REG. U. S.

The New-Day Dentifrice

A scientific film combatant, whose every application brings five desired effects. Approved by highest authorities, and now advised by leading dentists everywhere. All druggists supply the large tubes.

10-Day Tube Free 740

THE PEPSODENT COMPANY,
Dept. 332, 1104 S. Wabash Ave., Chicago, Ill.
Mail 10-Day Tube of Pepsodent to

.....

.....

.....

Only one tube to a family.

The reason

why motorcycling is the king of sports

for red-blooded men, and real girls!

It gives the exhileration of flying, of being astride living power — as in horseback riding.

It gives the joy of travel — at your own will, the health of outdoors.

It gives economy, comfort, dependability.

— all are yours, with an

Indian

The Standard Motorcycle of the World

Ask your dealer for a demonstration or write department 37 for literature

Hendee Manufacturing Company

Largest Motorcycle Manufacturer in the World

Springfield, Massachusetts

No Money Down

The Genuine GOLD MEDAL Electric Washing Machine on

2 Weeks Trial

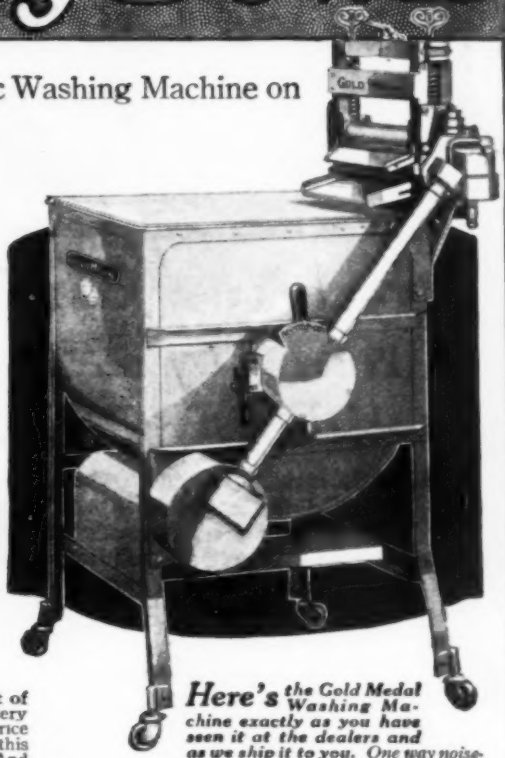
Sensational offer—send coupon for free catalog.
The world's best machine—the winner of the Gold Medal at the Panama-Pacific Exposition in 1915—sent direct to your home for two weeks of washing ***without a penny down!*** Convince yourself *first.* No risk to you. Not a penny of cost—not even freight charges—if not satisfied. And — for a limited time, on a direct factory offer, only

$99.50!

Yes, $99.50 net—the genuine Gold Medal machine—the best of all machines, washes as well as any make at any price—the very best. The factory price direct to you — less than the price dealers have been paying and are paying right today for this same machine, for this exact, identical 1921 model. And besides—***special easy monthly terms—as low as***

$4.00 a Month!

Easy terms depending upon amount of first payment—but no money in advance — two weeks' trial first — then, if satisfied, a year to pay!



Here's ***the Gold Medal Washing Machine exactly as you have seen it at the dealers and as we ship it to you.*** *One way noiseless cylinder*—daintiest laces are safe. *Lovell Electric Swinging Wringer with Automatic Safety Release,* recognized the best wringer made. DOMESTIC ball-bearing motor, known as best for washers. Automatic oiling. *All moving parts enclosed, no danger to children.* Celebrated Armco Rust-Resisting Iron (used throughout) is proof against any kind of water, soap and alkalis. A good sized family washing finished in about 1½ hours at a cost of only 2½c for electricity. Can be run from any electric light socket or from farm lighting plant. Every Gold Medal machine shipped on this offer is ***fully guaranteed.***

Catalog Free

5000 of These

1921 Model Gold Medal Washing Machines were offered to us by the manufacturer (who was overstocked) at the factory cost *for quick sale.* We guarantee that these machines were formerly priced by the factory, to sell up to $165. But on this factory output offer, only $99.50 direct to you—the equal in value of other machines priced up to $165. And on 2 weeks free trial and easy terms.

Send coupon—no obligation. Get our completely illustrated catalog, FREE. Learn about our special factory output offer:—5,000 Genuine Gold Medal Electric Washing Machines, 1921 Model, *while they last* $99.50! First come, first served. Don't wait—send for catalog *now!*

Straus & Schram, Dept. 1779
West 35th Street Chicago, Illinois

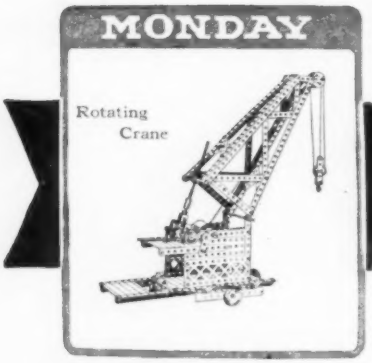
Straus & Schram
Dept. 1779 W. 35th St., Chicago

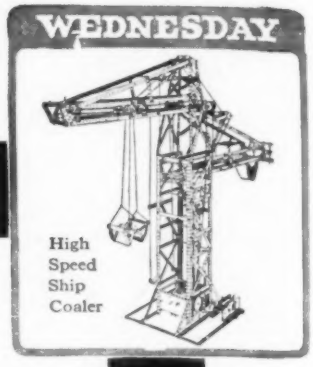
Send me your complete catalog of Gold Medal Electric Washing Machines and details of your 2 weeks free trial, easy payment, direct factory offer. No obligation.

Name .....

Address .....

Madam: It is time to get through with THE DRUDGERY OF THE WASHBOARD *which has killed more women than war has killed men.* Surely the family can save enough for the small monthly payment to keep the mother well and happy. Send this coupon for free catalog *now!*





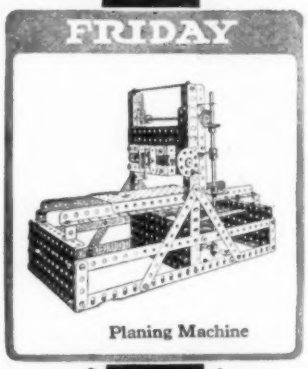
Boys! You Can Have A New Toy Every Day *with* MECCANO

THERE is simply no end to the fun you can have—fun building Cranes, Bridges, Airplanes, and all kinds of machines, fun making them work, fun taking them to pieces and building something else—all with the same Meccano parts. The Big Book of Instructions in each outfit makes everything clear even to the youngest boy.

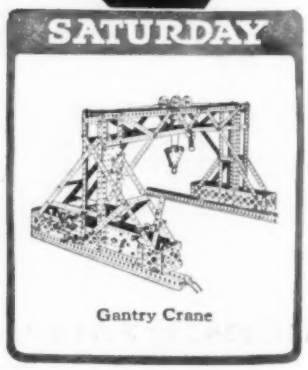
Send for This New Meccano Book

This beautiful new book shows boys how to enjoy every minute of their play hours with Meccano. Every page is brimful of boy fun and happiness. Sent free if you send us the names and addresses of three chums. Put No. 26 after your name for reference.

FREE TO BOYS



MECCANO COMPANY
INCORPORATED
Div. H, 71 W. 23rd St., New York City



$1250 PRIZE CONTEST

Ask your dealer for free entry blanks, or write us.

The Thrill of a Lifetime!

That new bicycle glistening under the Christmas Tree

Mothers and Dads—remember the thrill of your lifetime. The thrill that came when you realized that at last you were the proud possessor of a bicycle—realized it as you saw its glistening newness under the Christmas Tree.

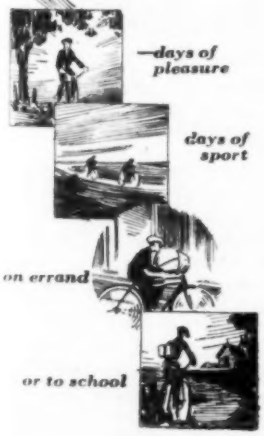
Now—your own boy can experience that same thrill. Buy him a Crown bicycle this Christmas, and you will gladden his youthful days. Boys know value—and these modern youths specify the finest make as the fulfillment of their heart's desire. They know the Crown—don't you, fellows? That bicycle beautiful can easily be distinguished by its snow white spear-point head.

Sport—pleasure—errand, the boy on a Crown wins. Speed—endurance—riding ease—all at his command. The boy should have a Crown bicycle—it stands head and shoulders above ordinary bicycles and its sturdy frame is always ready for him to mount and be off.

No matter where you ride on a Crown its smooth action reduces pedaling exertion to a minimum; your ride on a Crown is one of perfect ease and enjoyment.

Practically all parts of the Crown are made in one factory—more so than for any other make of bicycle—therefore, the manufacturers can really guarantee it. The Crown is not a mere assemblage of parts, but a finished product from one factory.

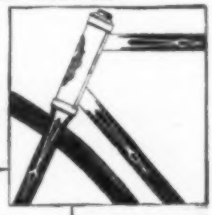
Drop in and see the Crown dealer today. He will gladly show you the Bicycle Beautiful.



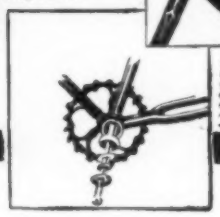
The boy on a Crown Wins!

Crown

The Bicycle Beautiful



Enamel used is the very best, giving a piano finish. Design patented white heads with spear-point. They stay white.



Genuine Fauber crank sets standard for 20 years giving perfect alignment of cups and cones, making an easy riding power plant, made exclusively by us.

The Great Western Mfg. Co., La Porte, Ind.

LEARN A TRADE

SWEENEY AUTO AND TRACTOR SCHOOL

I'LL PAY YOUR RAILWAY FARE TO KANSAS CITY

MY BIG ANNOUNCEMENT THIS SEASON. You can come to this great trade school at no more expense than if it were located in your home town, for I am rebating fares from any point in the U. S. to the Sweeney School. No advance in tuition. No extras. Just a fair, square rebate. No matter where you live, this brings the *Sweeney Million-Dollar School* to your door.

The Million Dollar Sweeney Auto-Tractor-Aviation School is directly across from Union Station, Kansas City. Every square inch of this great 10-story building used exclusively for the training and welfare of Sweeney Students. Not a PART of it, but ALL of it. The building contains twelve acres of floor space; ten floors of workshops; equipped with over a quarter million dollars' worth of equipment; besides this, it contains club rooms, swimming pool, restaurant, post office, and every convenience for the student.

The Sweeney System, famous the world over, can be had only in the Sweeney School. This system uses tools, not books. It trains men to be mechanics by practical work. You learn by doing. Over 46,000 graduates testify to the wonderful success of this trade-teaching system. The course takes only 8 weeks. No place in the world can you get so much real instruction, so much actual value, for so little money.

Get This Wonderful, 72-Page Catalog, magnificently illustrated. It tells how any man, without previous experience, can become an expert mechanic in a short time and EARN BIG MONEY. Tells of wonderful opportunities in the Auto and Tractor business; of hundreds of good jobs open NOW for SWEENEY TRAINED MEN.

Write for this catalog today.

FOR BIG FREE CATALOG MAIL THIS COUPON

EMORY J. SWEENEY, President
Dept. 967, Sweeney Building
Kansas City, Mo.

Please send me free without any obligation on my part your 72-page catalog and your Sweeney School News. Tell me of the opportunities in the Auto and Tractor business.

Name .....

P. O. ..... State .....

LEARN A TRADE
Sweeney
SCHOOL OF AUTO-TRACTOR-AVIATION
967 SWEENEY BLDG. KANSAS CITY, MO.

Two generations of skilled machinists have learned to know Starrett Tools and to trust them.

Under the tuition of these men, thousands of apprentices are today learning for themselves the superior value in every Starrett Tool. No more conclusive evidence of quality could be asked than the marked preference for Starrett Tools shown by these men, to whose livelihood the selection of good tools is an essential matter.

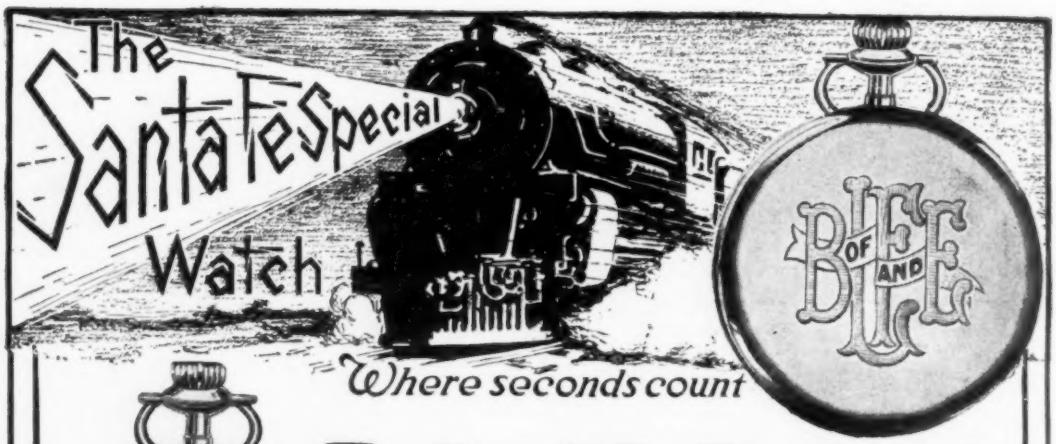
2100 fine tools are described and illustrated in the new Starrett Catalog No. 22"AP" Sent free on request. Write for copy.

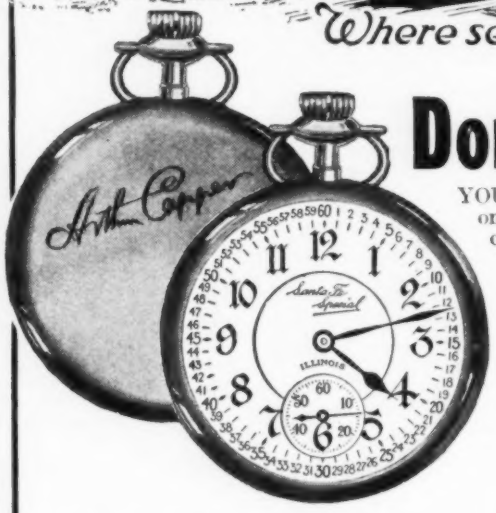
THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

42-252

Starrett Tools





Don't Be Too Late!

YOUR SUCCESS depends upon two things: Being on time and promptly grasping opportunities offered you.

You can't be punctual and on time without a reliable watch, and we are now offering the greatest opportunity you will ever have of buying the famous SANTA FE SPECIAL at such a low price.

There is no better watch made than the SANTA FE SPECIAL. When you get one you are assured it will pass all tests and our lifetime guarantee gives you permanent protection in your purchase.

Write today and let us explain our lifetime guarantee, our low prices and easy payment plans. Give us your Xmas gift order at once.

Alonzo D. Thomas

President, Santa Fe Watch Company.

New Case Designs

I want you to see the newest designs in cases used on these "Santa Fe Special" Watches, so you will fully realize their beauty and up-to-dateness, as well as the value of the Bargain I am offering you. I want you to see the 3-color inlay work—think how distinctive and personal **Your Watch** would be with your name, monogram or some appropriate emblem engraved in the case just to suit your own ideas. You will also want to see the new French Art designs in engraved cases—all shown in **My New Free Watch Book,** printed in beautiful colors.

Write today, it will be sent FREE.

A letter, post card or this coupon will bring my new free watch book.

Santa Fe Watch Company
Dept. C. 6, Thomas Bldg., Topeka, Kans.

Please send me your New Watch Book with the understanding that this request does not obligate me in any way.

Name .....

Address .....

State .....

The ILLINOIS Famous $ Santa Fe Special 21 JEWEL RAILROAD WATCH 3.50 A MONTH

The Standard Railroad Watch

that is GUARANTEED FOR A LIFETIME OF SATISFACTORY SERVICE. These watches are now in service on practically every railroad in the United States and in every branch of the Army and Naval service. Thousands of them are distributed around the world. Your name or monogram and any emblem you may desire will be engraved in the case to suit your own ideas. Write today for my Free Watch Book—make your selection.

Save One-Third to One-Half the price you pay for a similar watch made by other Manufacturers. Most Liberal Offer Ever Made. Our "Direct-to-You" low terms and Extra Special Distribution Plan are fully explained in the New Santa Fe Special booklet just off the press. The "Santa Fe Special" plan means a big saving of money to you and you get the best watch value on the market today. Watch sent for you to see without one penny down.

THE SANTA FE WATCH CO.
Dept. C. 6, Thomas Bldg., TOPEKA, KANS.
(Home of the Great Santa Fe Railway)

One Man and This Machine Can Earn $500 a Month

FIVE hundred dollars month is low estimate. Many make more. Gibbard, Mich., had amazing record of $60,000.00 last year! Others had wonderful successes. My new Tire Surgery machine did the trick!

HAYWOOD'S TIRE SURGERY

is the new and better tire repair method. You can learn in two weeks. I'll teach you. I'll furnish you with one of these new, compact Tire Surgery outfits. Will place you on direct road to fortune and financial independence. Your determination to succeed and this wonderful machine is all you need.

Experience Not Necessary

To start is the thing! Haywood's easy Tire Surgery method and Haywood's "One Man" machine will do the rest. Will make money for you—lots of it—from very beginning. Charlie Evans of Indiana, carpenter, past middle age, knew nothing of tires less than year ago. He bought a Haywood machine. Learned Tire Surgery. Now is earning more than $100 week!

Opportunity Never Better

Seven million car owners in country. Most of them must economize. Can't buy new tires. Must make old tires do. They can tinker with their auto, but can't mend tires. This work will swamp present Tire Surgery stations. Many more needed in every section of United States.

I Can Place 500 Men in Good Locations Right Now!

It's a proposition you can handle. Cash in on this great economic wave that is sweeping old tires into repair shops instead of junk piles. Etzrodt of Pennsylvania averages $30,000 in this business. Blair of Ohio does more than $100 daily with small Tire Surgery shop. Oldham of Illinois reports recent earnings of $2200 in four months. And so on. These men acted. They had no experience. Possessed very little capital. Enjoyed no advantages you haven't got.

M. HAYWOOD, Pres.
HAYWOOD TIRE & EQUIPMENT CO.
884 Capitol Avenue Indianapolis, Ind.

$6000.00 Year Easy

Haywood's Tire Surgery is so successful—so profitable—because it is thoroughly efficient. Look at the machine. See how compact and complete it is. Whole plant can be placed in space eight feet square. Observe its convenience—how one man can easily watch every detail from steam plant to vulcanizing without turning head. Look at its capacity—think of the dollars it will pour into your pockets in one single day. Its operation is so simple any man can do perfect work without long experience or apprenticeship.

Fill Out Coupon Now!

I have ready to mail you, the day I get your request, a fascinating book which tells all about tires. How to repair them by the Haywood method of Tire Surgery. How to start in business. How to build up trade. What to charge. You needn't write a letter. Just tear out the coupon right now. Fill it in and mail. Within 48 to 72 hours you can have the whole proposition before you. It's a case of walking right into $3000 to $6000 a year. Use the coupon below.

Send for Free Book

M. Haywood, Pres.
HAYWOOD TIRE & EQUIPMENT CO.
884 Capitol Ave., Indianapolis, Ind.

Dear Sir: Please send me by return mail your free book on the new Haywood Tire Surgery method and the details of this profitable business.

Name.....

Address.....

.....

BUY IT FROM THE NAVY

Surplus Navy Radio Materials for sale at attractive prices.

RECEIVING SETS

suitable for receiving ship, amateur or long wave signals.

SPARK TRANSMITTERS

complete with motor generators or gas engine driven generators.

ACCESSORIES
(Except Vacuum Tubes)

of every description, suitable for experimental or research purposes.

This is an ***excellent opportunity*** for Colleges, Radio Schools and Amateurs to buy ***Navy R-A-D-I-O*** equipment at ***attractive prices.***

Write Today for Navy Radio Catalogue No. 601-41

The surplus materials the Navy has available for sale have been grouped as shown below, and catalogues describing these materials will be sent on your request.

List of Surplus Materials

All Materials.
Aeronautical Equipment.
Aluminum.
Bath Room Fittings and Plumbing Supplies.
Blankets.
Boats.
Books.
Brass.
Canvas and Tents.
Chemicals.
Cloth and Textiles.
Clothing.
Copper.
Electrical Equipment and Supplies.
Furniture.
Hardware.
Iron.
Lead.
Machinery.
Mess and Galley Equipment, (Kitchen and Dining Room).
Monel.
Musical Instruments.
Navigating and Instruments of Precision.
Oils and Greases.
Paint and Paint Materials.
Provisions.
Radio Equipment.
Rope and Twine.
Stationery and Office Equipment.
Steel.
Tin.
Tools, Hand, Machine and Contractors.
Valves and Fittings.
Zinc.

Central Sales Office
NAVY DEPT. WASHINGTON, D. C.

Insist on them for Christmas

Roy Mc Whirter, youthful holder of the world's 3-mile record, and his trophies, won on NESTOR JOHNSON'S.

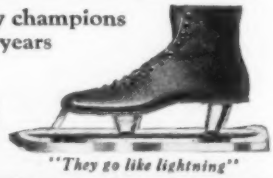
Oh Boy!
RACERS!

Like every red-blooded American boy, you've always wanted racers. Here are the kind the ***champions*** use—NESTOR JOHNSON North Star Racers—the fleetest and finest skates known. ***Get your pair this winter.*** With your paper money, or for Christmas. Snug, warm, ankle-supporting shoes come attached. At your dealer's or write us. Hockey style, too.

NESTOR JOHNSON MFG. CO., *Chicago, Ill.*
1245 North California Avenue

NESTOR JOHNSON
NORTH STAR
TUBULAR SKATES

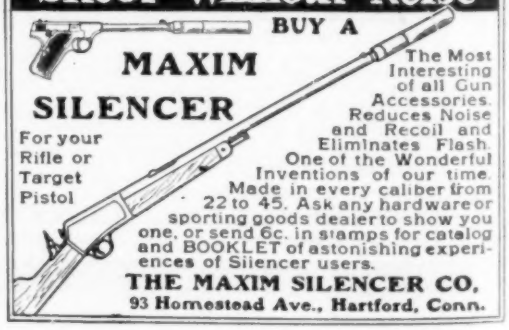
Used by champions for 30 years



Be sure the name NESTOR JOHNSON is on the skate you buy.

"They go like lightning"

Shoot Without Noise



BUY A
MAXIM SILENCER

For your Rifle or Target Pistol

The Most Interesting of all Gun Accessories. Reduces Noise and Recoil and Eliminates Flash. One of the Wonderful Inventions of our time. Made in every caliber from 22 to 45. Ask any hardware or sporting goods dealer to show you one, or send 6c. in stamps for catalog and BOOKLET of astonishing experiences of Silencer users.

THE MAXIM SILENCER CO.
93 Homestead Ave., Hartford, Conn.

RAILROADING
The Best fun of all

Speed 'er up Bill—that's the stuff—easy on the curve—there she goes through the tunnel—Wow!—Look-out!—the semaphore is against us—that's the boy—stop 'er at the station of Joyville—headquarters of all "American Flyer" Railroads.

Made in the U. S. A.

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"The Train with the Guarantee" Registered U.S. Patent Office
MINIATURE RAILROADS
"The Toy for the Boy"

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Boys and Girls—the coupon in the corner is to help you get a real "American Flyer" Miniature Railroad for Christmas. Sign your name, cut it out around the dotted line and leave it on the dressing table in Father's or Mother's room—they will take care of it.

We make a complete line of "American Flyer" Railroads—electrically or mechanically driven—a size and a price to suit everybody. Besides being the most satisfactory trains to operate they *cost less* than any other *good* outfit. There's all kind of equipment with "American Flyers"—tunnels, bridges, switches, crossovers, semaphores, stations, lights, and track.

Dear Dad—
I want an "American Flyer" Railroad for Christmas.
Here's hoping I get it.

THE AMERICAN FLYER MFG. CO., 2219-2239 South Halsted Street, Chicago

Actual photo of one of our rebuilt Underwood Typewriters.

GUARANTEED REBUILT TYPEWRITER EMPORIUM Shipman-Ward CHICAGO UNDERWOODS

$3 DOWN And It's Yours

Standard Underwood

Rebuilt like new. Every typewriter is factory rebuilt by typewriter experts. New enamel, new nickeling—new lettering, new platen, new key rings, new parts wherever needed—making it impossible for you to tell it from a brand new Underwood. An up-to-date machine with two-color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, etc. In addition, we furnish FREE, waterproof cover and a special Touch Typewriter Instruction Book. You can learn to operate the Underwood in one day

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Yes, only $3 brings you this genuine Rebuilt Standard Visible Writing Underwood direct from our factory, and then only small monthly payments while you are using it makes it yours; or, if convenient pay cash. Either way, there is a big, very much worth-while saving, too. Genuine new Underwood parts wherever the wear comes—genuine standard four row, single shift keyboard—thoroughly tested—guaranteed for 5 years.

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Typewriter Emporium
Shipman-Ward Mfg. Co.
2129 Shipman Bldg., Montrose and Ravenswood Avenues, Chicago, Illinois

Send by return mail Bargain Offer No. 2129 of a Standard Visible Writing Underwood. This is not an order and does not obligate me to buy.

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All shipments made direct to you from our big modern factory (shown above)—the largest typewriter rebuilding plant in the world

BUY TODAY 10 MONTHS TO PAY

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B14 — Superior fine Diamond in beautiful hand-engraved Platinum ring..$100

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B16—Sweet's Engagement ring set with fine blue-white Diamond $35

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B18—[illegible] Platinum top [illegible] Gold ring set with 1 fine Diamond $50

B20—Beautiful lavalliere genuine pearls, fine Diamond ...$28

B19—Solitaire Cluster, 7 fine Diamonds set in Platinum $85

B21 — [illegible] four White Gold inverted hearts are set with 1 superior quality, sparkling Diamond....$75

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Thousands of exquisite designs to choose from—every article a Rare Bargain. *"Satisfaction guaranteed or-your-money back."*

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B26—Beautiful hand-engraved White Gold mounting set with superior Diamond.$50

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B28—Sweet Engagement ring set with one superior, fine Diamond $110

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B30—Octagon-shaped solid 14K White Gold exquisitely hand-engraved, guaranteed 15 Jewel movement $30

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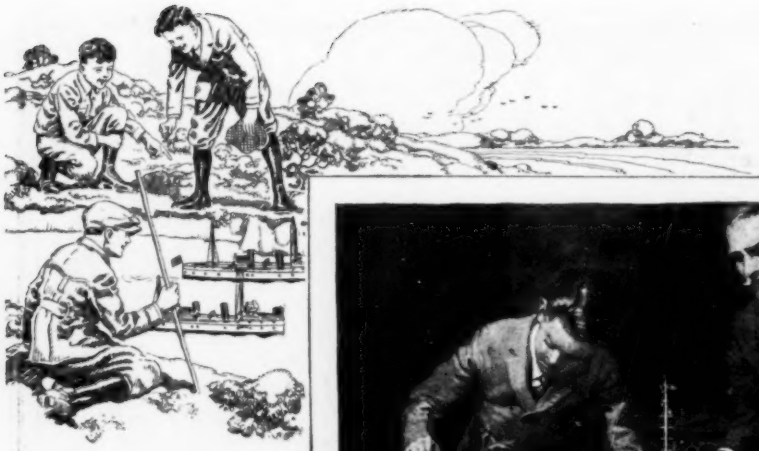

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LOCOMOTIVES and ships fascinate a boy. Playing with toy trains and boats is the best fun in the world. They never seem to lose their appeal.

Ives trains are wonderful reproductions of originals. There are both steam and electric type locomotives, propelled by springs or electricity, cars of all kinds —passenger, freight, coal, oil, lumber, livestock; with switches, bridges, tunnels, stations, signals, station lights and crossing gates. Ives boats are made of steel, beautifully painted, with long-running spring mechanisms, propellers and rudders. Real ships were used for models—ocean liners, diving submarines, destroyers, tug boats, motor boats, U. S. Merchant Marine Steamships.

Ives trains and Ives boats are sturdy American-made toys that every boy would like to own. They are a perfect Christmas gift.

Send 10c. for Booklet of Trains and Boats

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Ives Toys

Make Happy Boys

AMERICAN TOYS

REGISTERED TRADE MARK

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These Amateur Chemists tell how they have Real Sport and Learn Chemistry the easy way

YOU can be an Amateur Chemist, too, and work hundreds of interesting, amusing and instructive chemical experiments with your own chemical laboratory, just like these boys of the Bellevue ChemCraft Chemist Club. Chemical experimenting is great fun. It will keep you interested and fascinated and teach you useful facts.

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Read this Letter from the Secretary of the Bellevue ChemCraft Chemist Club

"I am sending you two pictures of our ChemCraft Chemist Club. The group shows eight members; the other our laboratory. Chief Chemist Nichols is a live wire. He stands in the center with the bottle in his hands. We have regular meetings and perform many experiments. Chief Chemist Nichols assigns experiments to all members to be performed by them at the next meeting, with the chemical explanation. We have prize contests and all the members get a lot of fun out of them. We all enjoy the Club Magazine you send us

"We publish a Club paper, too, with the news of our Club; and also sheets with new experiments. Our Club was started by Chief Chemist Nichols and nearly every member has his own CHEMCRAFT outfit. We are all learning a lot about chemistry and it's a mighty fine thing to know. The fun we have beats anything we ever did before. Any boy who wants interesting fun should join the Club and start his own Local Chapter. Any Club member wishing to correspond with our Local Chapter may do so by addressing me. David S. Morton,
Secretary, The Bellevue
ChemCraft Chemist Club,
1017 Bellevue Ave., Syracuse, N. Y.

Free to Boys Who Write at Once!

Sample copy of Club Magazine full of new stories, and our interesting book of Porter Products. Write for them right away.

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Just like dad's. Made in two weights, medium and extra heavy—in sizes from 2 to 16 years. Two to 4 year sizes have drop seat.

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We guarantee Hanes Underwear absolutely—every thread, stitch and button. We guarantee to return your money or give you a new garment if any seam breaks.

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Ten Years of Sport at the Cost of a Summer's Outing

YEAR after year, every vacation is filled with outdoor fun when you own an Evinrude. With this husky little motor clamped to rowboat or canoe you can go where you like on the water. Upstream to fish, across the lake to the marshes for ducks or off on a trip to neighboring camp or resort—without a stroke of oar-work!

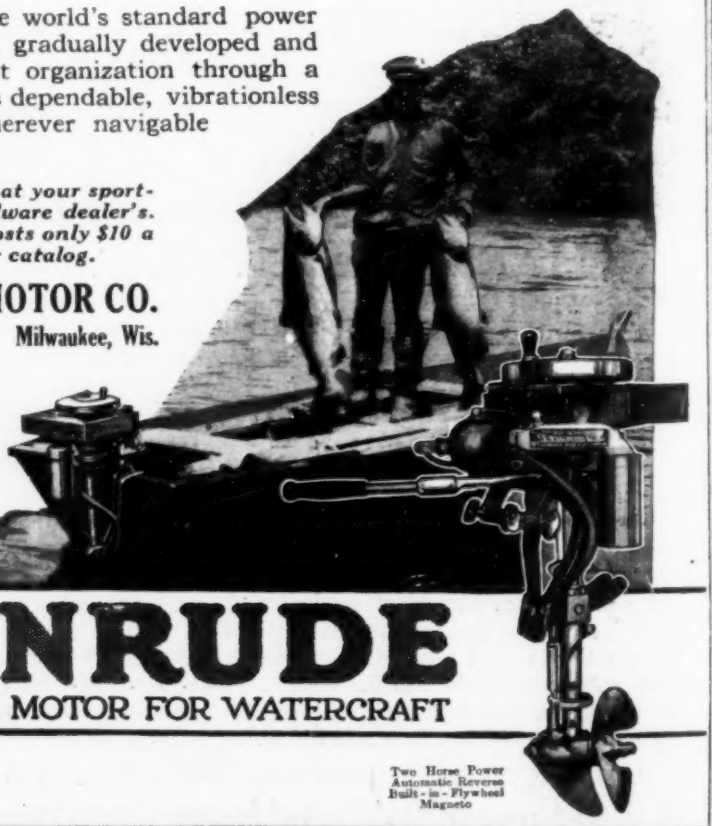
How little it costs to buy and operate an Evinrude! Only $10 a year if you divide its price by its life. A penny a mile for "gas" and oil. An all day cruise for half a dollar. What other sport is half so economical?

The Evinrude is the world's standard power plant for watercraft, gradually developed and perfected by a great organization through a period of years. Its dependable, vibrationless power is known wherever navigable water flows.

See the Evinrude at your sporting goods or hardware dealer's. Ask him why it costs only $10 a year. Or send for catalog.

EVINRUDE MOTOR CO.

510 Evinrude Bldg. Milwaukee, Wis.



Evinrude Playgrounds No. 10

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DETACHABLE MOTOR FOR WATERCRAFT

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A5—Hand engraved Tulip model solid 14K white or green gold case, 15 Jewel guaranteed movement, $37.50.

A6—Ladies 14K white gold hand engraved, set with 3 perfectly cut blue white Diamonds, $55.

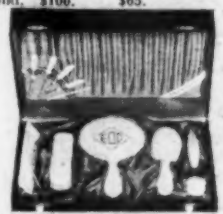
A7—14K white gold [illegible] with 7 perfectly matched blue white Diamonds, $110.

A8—Ladies im[illegible] onyx ring, [illegible] beauty blue white [illegible] Diamond pieces, 14K mounting, $30.

A9—White and green gold Lavaliere, Diamond center, $25.

A10—[illegible] Men's 14K solid gold Tooth ring, first quality blue white Diamond, $100.

A11—Ladies 14K solid gold ring, perfect cut, first quality Diamond, $65.



A15—11 Piece French Ivory toilet and manicure set, chest 11x[illegible] 11x1, $30.

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Make $15 to $25 a Day and be happy doing it

GET a job you can't lose! You can make $90 to $150 a week as District Sales Manager for the Wizard Kerosene and "Quicklit" Lamps and Lanterns — *if you can qualify!* We want men who are capable of doing big things — and of earning big money right now. The Wizard Kerosene and "Quicklit" Lamps and Lanterns are the only sure lamps and lanterns that always give all the light that is needed — never get out of order—cannot leak, explode, catch fire. "Quicklit" burns gasoline—and lights with ordinary matches. Gives more and longer light for less fuel. Only lamps and lanterns made with automatic cleaning needle.

Demonstrate these superiorities and you will sell one to a dozen lamps and lanterns a day easily.

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You can sell direct or through dealers. Build your own business—have a dealer in every town working for you. We need *real* men who are able to *earn* big money. If your time is worth $15 to $25 a day, wire or write your application today with full particulars of your ability.

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Under the table, down in the cellar, into a trunk or any old place. With our **VENTRILO** which fits into the mouth you can have lots of fun fooling your friends. Also full instructions in the art of **Ventriloquism,** and big book of jokes. Sent by mail for **10 cts.** Stamps or coin.

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on rebuilt at the factory by the well-known "Famous Young Process." Sold for low cash —installment or rented. Rental applies on purchase price. Write for full details and guarantee. Free trial.

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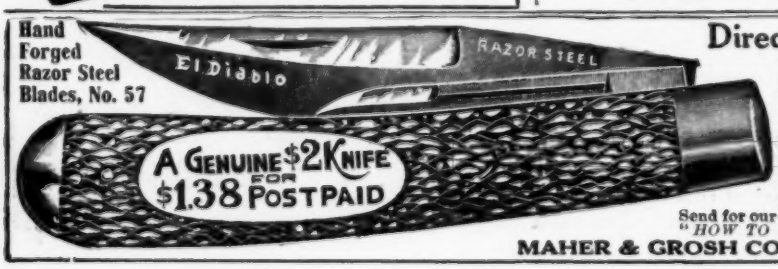

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2 H-P Engine

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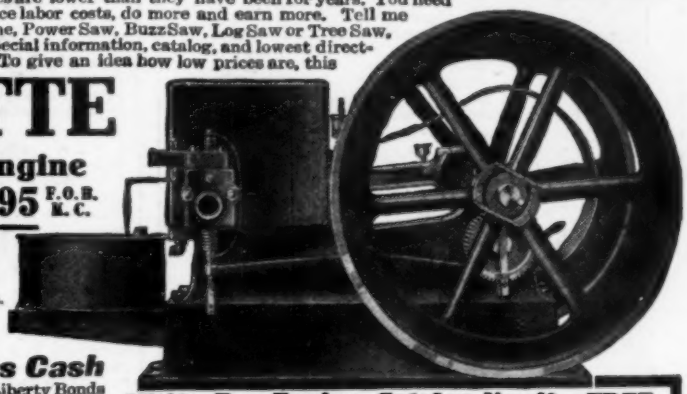
From Pittsburgh, $5 More.



Here is a chance to get your power plant, any size, up to 30 H-P., at a big saving. I can make Immediate Shipment, guarantee safe delivery. Engine shown is shipped on skids, ready to operate. Easy to set and use. Easy to buy now.

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WITTE
Latest Out Log Saws
Run Steady — Cut Faster.
Shipped Complete — Engine and Saw as Shown — Ready to Use.

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We will include regular $35 Tree Saw equipment FREE with every WITTE Log Saw.

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$99.50 F.O.B. K.C.

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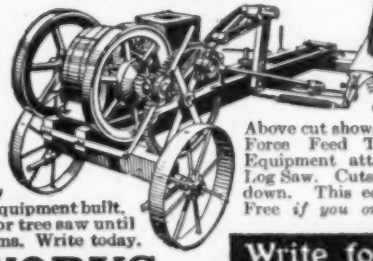
The WITTE Log Saw is a Big Capacity, strongly built outfit—Easy to operate. Runs all day on 2 gallons of fuel. Positive Lever Control. Start or stop saw while engine runs. Only Arm Swing Log Saw with Interchangeable Tree Saw Parts. Makes Log Saw a fast-cutting Tree Saw as shown. Change in 5 minutes. Clamps to tree **below saw** in 10 seconds. Most practical—lightest—easiest to use tree saw equipment built. Big 3-color catalog tells all about it—Free. Don't buy any log or tree saw until you know about the WITTE. Sold direct—Cash or Easy Terms. Write today.



Above cut shows WITTE Force Feed Tree Saw Equipment attached to Log Saw. Cuts tree clear down. This equipment Free *if you order now.*

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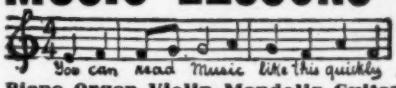

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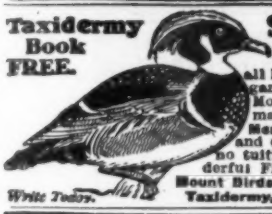

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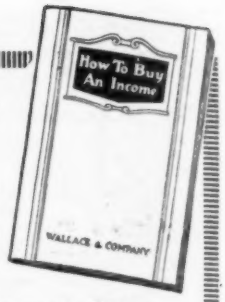

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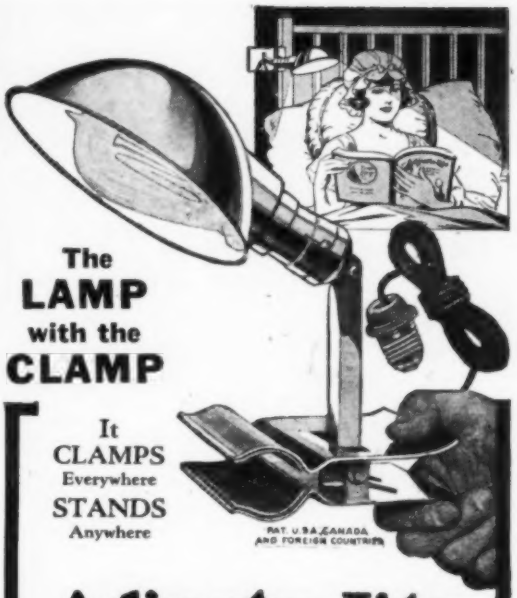

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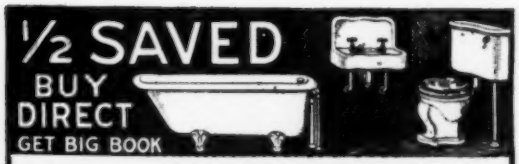

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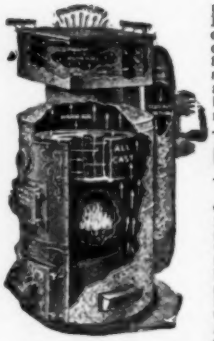
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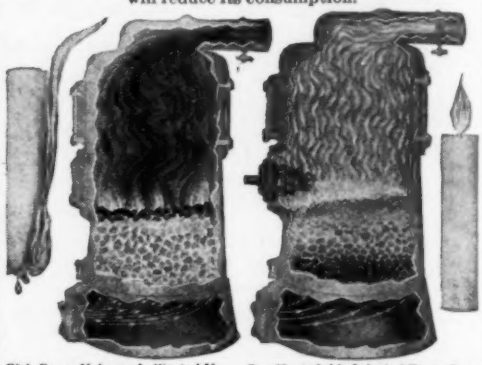

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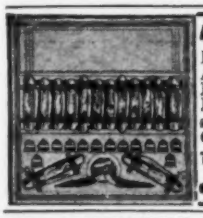

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For store fronts, office windows and glass signs of all kinds. No experience necessary. Anyone can put them on and make money right from the start.

$75.00 to $200 a Week!

You can sell to nearby trade or travel all over the country. There is a big demand for window lettering in every town. Send for free samples and particulars. **Liberal Offer to General Agents.**

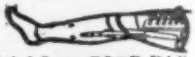
METALLIC LETTER CO.
433B North Clark Street CHICAGO, ILL.

"BOW LEGS and KNOCK-KNEES" UNSIGHTLY

SEND FOR BOOKLET SHOWING PHOTOS OF MEN WITH AND WITHOUT THE PERFECT LEG FORMS

PERFECT SALES CO.
140 N. Mayfield Ave., Dept. 5, Chicago, Ill.

Fibre-Lite Limbs



Easy Payments—Do Nature's Work.
AGENTS WANTED who use Artificial Leg. GOOD PAY.
FREE Fibre Sample. DESCRIBE STUMP TO **WORMAN CO.** 252-P HENNEPIN AVE. MINNEAPOLIS, MINN.

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Save money. Try this wonderful range at OUR RISK. **We pay the freight.** Over 150,000 in use. All sold on THIRTY DAYS' FREE TRIAL.

Great Fuel Saver. Wonderful Baker!

Housewives delighted with results. Amazing demand. Many exclusive features. **Odor Hood**—carries all odors up chimney. **Ash Sifter**—sifts ashes right in range. No dust. **Stone Oven Bottom** absorbs and **holds** heat. Makes baking sure and successful. GUARANTEED. Will last for years. You can buy this wonderful range DIRECT FROM FACTORY at WHOLESALE PRICE—our only selling plan. New 1922 design has **white enamel front.** Hundred other styles from which to choose. **Easy Credit Terms** if desired. **Write today** for big FREE catalog.

THE IMPERIAL STEEL RANGE COMPANY
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"The Biggest Little Lathe Built"

A sturdy small engine Lathe built with the same quality construction that has made **MONARCH ENGINE LATHES** standard the world over.

An accurate, dependable machine tool especially designed for and guaranteed to do any small work that any other lathe will do with speed and accuracy.

MONARCH JUNIOR will fit in any shop or in a work-room right in your own home. They are especially designed for beginners—are easy to learn to operate and are equipped the same as any larger lathe.

The Greatest Achievement in Lathe Building History

Monarch Junior 9 in. Engine Lathe **$250** With Bench Legs

Full particulars and a Monarch Junior Catalog will be sent you on request.

THE MONARCH MACHINE TOOL CO.
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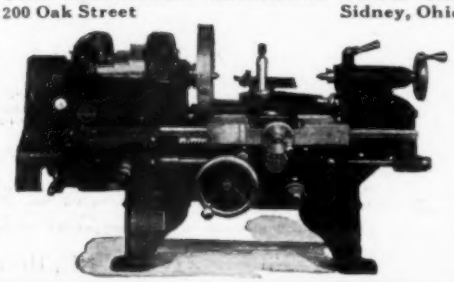

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Tools In Handle

A complete repair shop in itself. Sews anything heavy or light, leather, shoes, harness, buggy tops, canvas, belts, etc. **$1.00 Postpaid.**
C. A. MYERS COMPANY, 6339 Woodlawn Ave., Chicago, Ill.

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Pilliod Tool Cases are the strongest cases on the market for machinists, carpenters, auto mechanics, electricians, etc. Special cases for motormen, conductors, engineers, fishermen. Built in many sizes and styles. Write today for free catalog giving all details. **Pilliod Lumber Co., Dept. B, Swanton, Ohio**

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Just send your name and address—we will send you your choice of 12 size or 16 size, silver-ode open-face watch. **GUARANTEED** to give perfect satisfaction. Upon arrival, pay your postman only $3.95. Fully worth double. WRITE TODAY for our beautifully illustrated catalogue of Diamonds, Watches and Jewelry—It's FREE!

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TYPEWRITER SENSATION!

Free Trial—Use as You Pay

Send us only $5.00 a month until the low total price of $64.85 is paid, and the machine is yours.

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay $5.00 a month and own one. Think of it—Buying a $100.00 Machine for $64.85. Cash price, $59.85, just a little more than half its original price.

L. C. SMITH Model No. 5

Perfect machines, Standard size, Keyboard of Standard Universal arrangement, 42 Keys, writing 84 characters—universally used in teaching the touch system. The entire line of writing completely visible at all times, has the tabulator, the two color ribbon, with automatic reverse, the back spacer, ball bearing type bars, ball bearing carriage action, ball bearing shift action, in fact every late style feature and modern operating convenience. Comes to you with everything complete; tools, cover, operating book and instructions—nothing extra to buy. **You cannot imagine the perfection of this beautiful reconstructed typewriter until you have seen it. We have sold thousands of these perfect late style machines at this bargain price and every one of these thousands of satisfied customers had this beautiful, strictly up-to-date machine on five days' free trial before deciding to buy it.** We will send it to you F. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at our expense. You won't want to return it after you try it, for you cannot equal this wonderful value anywhere.

SEND NO MONEY

$4.85 AFTER TRIAL

Put In Your Order *Now*

When the typewriter arrives deposit with the express agent $4.85 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw keep it and send us $5.00 a month until our bargain price of $64.85 is paid. If you don't want it, return it to the express agent, receive your $4.85 and return the machine. We will pay the return express charges. This machine is guaranteed just as if you paid $100.00 for it. It is standard. Over half a million people own and use these typewriters and think them the best ever manufactured. **The supply at this price is limited, the price will probably be raised when next advertisement appears, so don't delay. Fill in the coupon to-day—the typewriter will be shipped promptly.** There is no red tape. We employ no solicitors—no collectors—no chattel mortgage. It is simply understood that we retain title to the machine until full $64.85 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. **Do not send us one cent. Get the coupon in the mails to-day—sure.**

SMITH TYPEWRITER SALES CO., 222, 218 N. Wells St., Chicago, Ill.

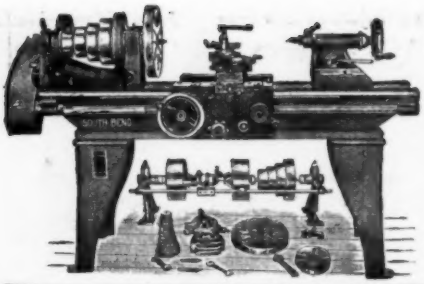
SMITH TYPEWRITER SALES CO., 222, 218 N. Wells St., Chicago, Ill.
Ship me the L. C. Smith Model No. 5, F. O. B. Chicago, as described in this advertisement. I will pay you $5.00 monthly as rent until the $60.00 balance of the Special $64.85 sale price is paid. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee.

Name.....

Street Address.....

City..... **State**.....

Occupation or Business.....



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Back to Normalcy — 20% Further Reduction

SOUTH BEND LATHES

	Standard Change Gear	Quick Change Gear		Standard Change Gear	Quick Change Gear
9"x3' Lathe	$176.00	$216.00	16"x 8' Lathe	$452.00	$512.00
11"x4' Lathe	228.00	273.00	18"x10' Lathe	656.00	721.00
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How to Run a Lathe An 80-page book, postpaid to any address for ten cents, silver or stamps accepted.

64-page Catalog No. 67 for 1921 sent free to any address.

ESTABLISHED 1906

SOUTH BEND LATHE WORKS, 625 E. Madison St., SOUTH BEND, IND.

Simplified Pipe-Threading

A man never threads pipe for pleasure—but that's no reason to let the job waste unnecessary muscle, causing bother and perspiration.

One experience with Oster Bull-Dog Die-Stocks has changed many a man's ideas of pipe-threading, because until a man has discovered for himself all the various benefits of the **5 Big Bull-Dog Features** he has never known the easy convenience of modern simplified pipe-threading. The 5 separate facts act in a dozen different ways to make each job easier.

THE OSTER MFG. COMPANY

CLEVELAND, OHIO

Ask your supply house or write for a Bull-Dog descriptive folder

OSTER

BULL-DOG DIE-STOCKS

DISSTON SAWS

"The Saws Most Carpenters Use"

HENRY DISSTON & SONS, INC.

Philadelphia, Pa. Canadian Works, Toronto, Can.

1/4 H. P., 110 volts, A. C., 60 cycle, single phase, 1750 R. P. M. MOTORS

LARGE QUANTITIES NEW WASHING MACHINE MOTORS

These are of standard manufacture and carry the full factory guarantee. Shipped in original boxes. Complete as cut. Suitable for operating Coffee Grinders, Cream Separators, Bottle Washers, Air Compressors, Small Lathes, Etc.

Mail $5.00 cash or Money order We will send C.O.D. subject to full examination. Money Back Guarantee.

Bargains Small Motors and Generators Write for Catalogue Special Quantity Prices-Value $12.50

$22.75 Each

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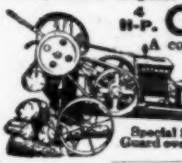
One Man Saw Rig

Cuts Faster—Pays for Itself

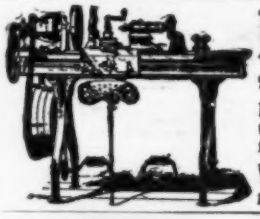
Saw your own wood for winter. Make big money cutting wood for market. New OTTAWA One-Man Saw Rig saves time and labor. Easily moved. Magneto equipped. No extras to buy.



4 H-P. **OTTAWA** Friction Clutch

A complete, powerful, 4-H. P. engine for belt work. 30 Days Free Trial. Buy for Cash or on Easy Terms. Write for FREE BOOK and new low factory price. Ottawa Mfg. Co. Dept. 171 Ottawa, Kans.

Special Safety Guard over saw.



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9 to 18-inch Swing

List price $165 and up according to size. When ready to buy send for Lathe Catalog and prices.

W. F. & John Barnes Co.

100 Ruby Street, ROCKFORD, ILL.

It is the well known quality of CRESCENT machines that justifies you in selecting one of them each time you have need for wood working machinery. The CRESCENT line is better than ever and will always give you satisfaction in every particular. Ask today for catalog of band saws, saw tables, jointers, shapers, planers, borers, planers and matchers, swing saws, disk grinder, cut off table, hollow chisel mortiser, variety wood worker, Universal wood workers.

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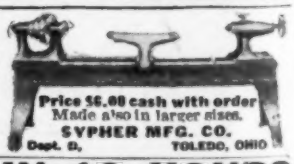
GOODELL-PRATT

1500 GOOD TOOLS

Swing 4in., 11 in. between centers, 17 in. total length. Shipping weight 13 lbs. Bed of lathe is machined. Workmanship first-class. Equipped with wood turning chuck. Can be fitted with 3 in. face plate and drill chuck as special equipment. Order one today.



Price $6.00 cash with order

Made also in larger sizes.

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BY ONE MAN. It's KING OF THE WOODS. Saves money and backache. Send for **FREE** catalog No. B115 showing low price and latest improvements. First order gets agency.

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The only stitcher that works with or without bobbin. A valuable feature. Saves refilling.

STEWART-SKINNER CO.

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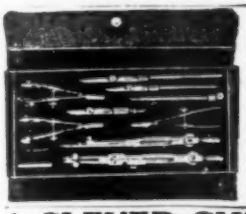

$20.00 Value Set Mechanical Drawing Instruments

Special Wholesale

Price $6.65 Postpaid

Pocket case 4x8½ inches—velvet lined — instruments constructed of solid nickel silver and steel — guaranteed. Order now—supply limited. *Free illustrated particulars.*

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A CLEVER CHRISTMAS GIFT

THE OLSON MAGAZINE SCREW DRIVER

Large enough to hang a door. Small enough to fix a bell. Used by—Carpenters, Machinists, Farmers and Automobile men.

Three blades and one awl guaranteed. Dealers and agents write for special proposition.

Only 5¾" long.

$1.25 Prepaid

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instantly, accurately. Just slide rule out. No folding; strong; brass-trimmed. Any length 2 to 8 feet. If not at dealer's, sent postpaid.

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"Interlox"
MASTER SLIDE RULE

Dealers and agents; Request attractive proposition.

Save Money On Your Tools!

Save your tools—prevent damage — discourage "borrowing" — have your tools in order and increase your efficiency.

A style, size and price to suit your trade and purse. Catalog free.

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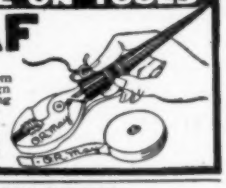
Protect your tools from theft. Write any name, engrave any design on metal with electricity as easily as writing on paper with pen or pencil. Complete outfit $3.50, prepaid anywhere. Circular and sample of work free. Write today. Agents Wanted. Arkograf Pen Company 695 Capitol Ave. Portland, Oregon



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Spirit Levels of Aluminum, Walnut and Pine, plain or brass bound. All sizes for all workmen on every kind of work. Descriptive folder price list free.

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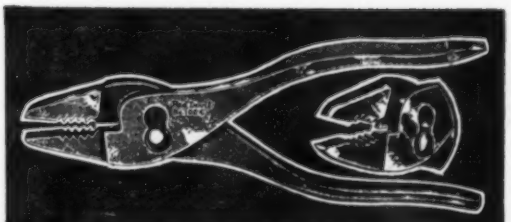

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Red Devil
Reg. U. S. Pat. Off.

Slip Joint Plier

THERE'S no end to the number of things you can make and mend with a pair of "Red Devil" Pliers. You will find them particularly handy around the house, in the garage or on the car.

"Red Devil" Pliers multiply the strength of your hand and wrist; they grip as your fingers can't possibly grip —no slipping, no bruised knuckles, no exasperation from trying to do good work with poor tools.

Forged of tool steel and properly designed to stand years of hard service. They work more easily and make for better results.

"Red Devil" Slip Joint Plier No. 1024

shown above, one of the most popular styles for all-around handiness. Made in 7-inch size—beautifully nickel plated.

At reliable hardware dealers everywhere, or from us . . **$1.25**

Mechanics' Tool Booklet FREE.

SMITH & HEMENWAY CO., Inc.
Manufacturers of "Red Devil" Tools
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***"Red Devil" Glass Cutters**—the glaziers' standard tools of the world. "It's all in the wheel." Made in 40 styles. No. 024 shown below, from dealers or from us, 20c.*

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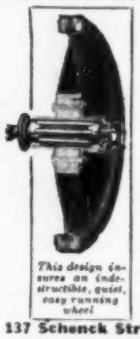
And Now Disc Wheels

(Patent Applied for)

Boys, you can now have steel disc wheels, just like the newest automobile wheels, on

AUTO-WHEEL COASTERS and AUTO-WHEEL CONVERTIBLE ROADSTERS

Disc wheels are just the thing for boy speeders. Like the regular wheels, they turn on self-contained roller bearings (a new ***Auto-Wheel*** improvement). They won't come off in a race—the special hub cap and locking pin make sure of that. And they are strong enough to stand up in the most strenuous speed tests.



This design insures an indestructible, quiet, easy running wheel

You can get these disc wheels or the regular wooden-spoke wheels with new wagons, and you can get the disc wheels separately for your old wagon. Write us about them. Send the names of three dealers, stating which sell the ***Auto-Wheel.*** We will send you a Dime Bank FREE and a year's subscription to the "***Auto-Wheel*** Spokes-man."

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Make Your Bike a MOTORCYCLE

Make your "foot-power" bike a dependable, easy-running, light-weight motorcycle at small cost. You can do it yourself with the

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Compact. Easy to attach. No special tools required. Battery or magneto. Thousands in use. Write at once for free book, prices, terms; also about Shaw Motorbicycle.

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95 to 125 Miles per gallon!

30 Days' Free Trial

Select from **44 Styles,** colors and sizes, famous **Ranger** bicycles. **Delivered free** on approval, from maker-direct-to-rider, at **Factory Prices. Save $10 to $25 on your bicycle.**

12 Months to Pay Immediate possession on our liberal Easy Payment plan. Parents often advance first deposit. Energetic boys earn the small monthly payments thereafter.

TIRES Horns, wheels, lamps, parts and equipment at half usual prices.

SEND NO MONEY—Ask for big free Ranger Catalog, marvelous prices and terms.

Special offer to Rider Agents

MEAD CYCLE COMPANY
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MOTOR CYCLE Cleveland

7th Year

TWO-STROKE, SINGLE-CYLINDER MOTOR

Smooth as a twin. Light-weight motorcycle. As safe as a bicycle. Simple, very economical and dependable.

Write for Catalog "M"

75 miles to the Gallon

Price **$225**

Cleveland Motorcycle Mfg Co.
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DENINGER WILL SAVE YOU 25 TO 50 DOLLARS

BIG MONEY SAVINGS FOR YOU

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Deninger Cycle Co., Rochester, N.Y.

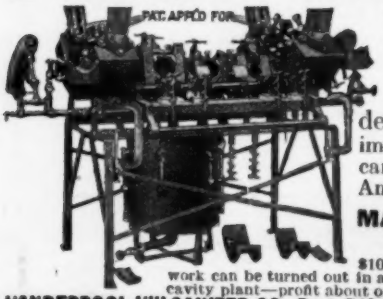
MOTORCYCLE BARGAINS

Save 25% to 65%

on Slightly used and Rebuilt Motorcycles, Side Cars, Johnson Motor Wheels, Evans Power Cycles, Bicycles. Send for **Free Bargain Bulletin and Money Saving Message,** listing hundreds of **Bargains** in used, rebuilt and new machines, supplies, accessories, etc.

AMERICAN MOTOR CYCLE CO.
Dept. 1791 2047 W. Chicago Avenue, CHICAGO

STEADY WORK



in a fast growing business. With Vanderpool latest improved Vulcanizer made in America you can

MAKE MORE MONEY

$100 to $150 worth of work can be turned out in a day with the five cavity plant—profit about one-half.

VANDERPOOL VULCANIZER CO., Dept. P12, Springfield, Ohio
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THE CORBIN DUPLEX COASTER BRAKE

is the standard brake equipment, assuring absolute control. Equip it now. Send for 1921 catalog.

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Tougher Than Elephant Hide

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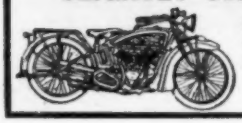
SLIGHTLY USED AND REBUILT

Of Standard Makes Only

Save 35% to 50% by buying of us. Catalog sent on request.



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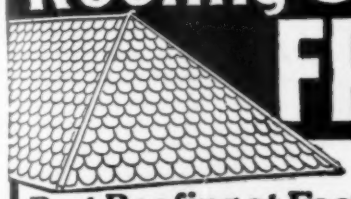

World's Best Roofing at Factory Price

Don't buy Roofing of any kind until you get our big Free Roofing Book, describing full line of Edwards Famous "Tightcote" Galvanized Roofings, Sidings and our lowest factory prices. Then see for yourself how much we save you by selling direct and saving you all in-between dealers' profits.

EDWARDS "REO" Metal Shingles

Absolutely rust proof. By our patented "Tightcote" process, edges as well as sides of metal sheets are heavily coated with zinc—not a space the size of a pin point exposed to weather. Fire and lightning proof. Outlasts three ordinary roofs. Forever wind and weather proof. Need no repairs—end all roofing expense. Patent INTERLOCKING DEVICE makes water tight seams—all nail heads covered—no chance for rust or leaks.

EDWARDS Galvanizing Test

Edwards "Tightcote" Galvanized Roofing can be bent, twisted or struck by lightning, and the galvanizing will not crack or flake. Bend it or hammer it—you can't loosen or scale the galvanizing. No other galvanized roofing can withstand this test.

Low Priced Garages

Wide variety of styles, all sizes of Portable Fireproof Metal Garages. Lowest prices ever made. Postal brings Big Garage Catalog free.

Write Today for free samples and proof that we can save you a lot of money on any kind of roofing, siding or ceiling you may need. Ask for Roofing Book No. 150.

THE EDWARDS MFG. CO.,
1208-1250 Pike St., Cincinnati, O.

FREE Samples & Roofing Book

DELTA
ELECTRIC BICYCLE LAMPS

Early Darkness Is Here

You need a Delta Electric Bicycle Lamp, because it gives you bright sunlight at night! Just snap switch on Battery case. Like automobile light—powerful, beautiful, durable; but smaller.

No. 80 (illustrated) solves rear red light problem—complies with all laws. Mounts left side front wheel, under axle nut.

At your dealer, or sent prepaid for $2.40 complete (less battery).

DELTA ELECTRIC COMPANY
100 Delta Block Marion, Indiana
Standard Makers of Electric Lanterns, Bicycle Lamps, and All Kinds of Dry Batteries
New York Winnipeg
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10 GALLONS GASOLINE FREE

The PaKoT Sales Co., 116 PaKoT Bldg., Kansas City, Mo., will send parcel post paid, to one person in each locality who will use it in his auto, tractor, or gas engine and recommend it, a $1.00 can of No-Carbon Oil, enough to make 40 Gal. of gasoline take you as far as 50, thereby giving you 10 gallons free. It cleans out carbon and lubricates top piston rings while you drive. Don't send any money. Write for introductory can and it will be sent postpaid.

10c CHARGES BATTERIES AT HOME WITH AN F-F BATTERY BOOSTER which is a Magnetic

Rectifier for 105-125 Volt 60 Cycle A.C. Lamp Socket. Carbon Electrodes rectify the current and last for thousands of hours. PRE-WAR PRICES. Bantam Type 6 Charges 6 Volt Batteries 6 Amps, $15; Type 166 for 6 Volt Batteries 12 Amps $24; Type 1625 Charges 6 & 12 Volt Batteries $36. Shipping Weights 12 to 15 Pounds. Also Boosters for 12 Volt Batteries at same prices and for operation from Farm Lighting Plants and Direct Current Circuits. Send Check for prompt Express shipment. Parcel Post remittance must include Postage and Insurance. Will also ship C.O.D. *Order now or write for free BOOSTER Bulletin No. 24 or F-F Rotary Rectifier for Group Charging Bulletin No. 24A.*

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APEX INNERINGS
(INSIDE PISTON RINGS)

fit under regular piston rings. Centralize piston and hold ring face to perfect alignment with cylinder wall. Save fuel; increase power; make old motors pull like new without re-boring cylinders. Quickly installed. Price 30c ea. up to ⅞ in. wide or 5 in. bore. Larger 50c. If dealer can't supply you ORDER COMPLETE SET (one for each piston ring). Give car model, year, size of piston rings, if possible.

THOMSON-FRIEDLOB MFG. CO.
Peoria, Ill. Dept. J.
Factory Branch, 58 W. Washington St., Chicago
TO DEALERS: Big demand exists. Write or wire on today's fastest selling accessory.

APEX Innerings
Guaranteed To Stop Oil Pumping and Piston Slap Or Money Back

MAKE YOUR FORD INTO THIS SPORT CAR $6.40 ONLY

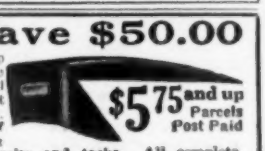
Other types down to $2.50. Famous sure fit. Ref-Kut life-size patterns and simple instructions show all details. You can easily convert your Ford into this fast, sassy Sport Car as hundreds have done with a few dollars worth of material from the hardware store. No need to lay up the car. The "PAL" with conical disc wheel patterns, Pressed Metal Streamline Rear only $6.40 delivered. Built low, rides wonderfully easy. Order NOW while we can make good delivery. *Send 5c coin for illustrated prospectus of Sport Bodies, "Jiffy"*

The "PAL"

Tops and "Goesum" Windshields. Kuempel Co., 57 Kuempel Bldg., Guttenberg, Iowa

You Can Save $50.00

By recovering your old auto top frame yourself. We make these recovers to fit all makes and models of cars. Any person that can drive a car can put it on. We furnish instructions. Roof and quarters sewed together with rear curtain, fasteners, welts and tacks. All complete. Give us the name, year and model number of your car, and we will send you our catalogue with samples and quote you exact price.



$5.75 and up Parcels Post Paid

LIBERTY TOP & TIRE CO., Dept. E7, Cincinnati, O.

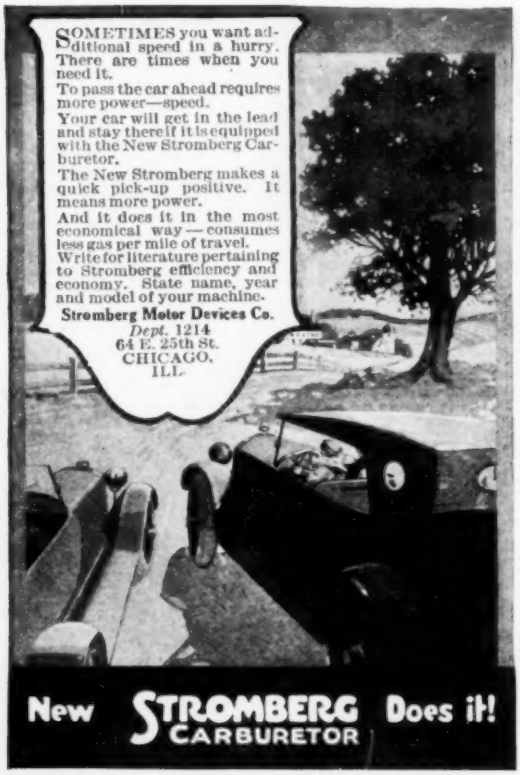
HB BIG PROFITS CHARGING BATTERIES

YOU CAN CLEAR $150 TO $300 A MONTH

$20 brings you an HB Charger. Pay balance on long, easy terms. An HB pays big, steady profits. No repairs, no trouble, easy to operate, no experience needed. Demand for battery charging is universal. Start NOW when winter brings biggest demand. HB outfits in size for 10, 16, 32 or 70 batteries. Let us recommend size to fit your shop. Write today.

Hobart Brothers Company
Box M-1277, TROY, OHIO

Small Cash Payment - Long Easy Terms



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To introduce one of the best automobile tires in the world. Made under our new and exclusive Internal Hydraulic Expansion Process that eliminates **Blow-Out—Stone-Bruise—Rim Cut** and enables us to sell our tires under a

10,000 MILE GUARANTEE

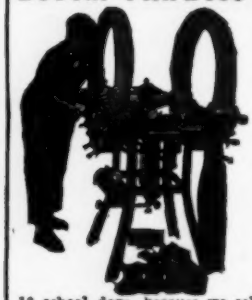
We want **an agent** in every community to use and introduce these wonderful tires at our astonishingly low prices to all motor car owners. We have a plan by which you can obtain

Free Tires for Your Own Car

if you become our representative. Write for booklet fully describing this new process and explaining our amazing introductory offer to owner agents.

Hydro-United Tire Co. Dept. 100 Chicago or Philadelphia

Be Your Own Boss—Make More Money



With little capital, you can establish a business in your home town and make $10 to $30 per day with Anderson Steam Vulcanizers. Better work, with less cost and bigger profits.

There are Anderson schools in 34 states, one is near you. Better schooling plus finest equipment makes Anderson tireologists successful.

We teach you the famous Anderson method of vulcanizing and the operation of the Anderson Super-Heated Steam Vulcanizer and Retreader.

Takes 5 to 10 days in school and costs $35. If at any time you buy an Anderson Vulcanizer, we refund your $35 and pay you $5 per day for each of the 10 school days, because we sell the work you do.

We will tell you how to make more money. Write today.

ANDERSON STEAM VULCANIZER COMPANY
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Oh Boy! BUILD THIS CAR

This nifty little car driven by gasoline motor, can be built by any boy. New 1921 Plans, bigger, better than ever, now ready. Send 50c for building plans and price list of parts showing how to build this lad's car.

SYPHER MFG. CO.
146 Sypher Bldg. TOLEDO, O.

RIDE A RANGER

bicycle and *know* you have the best. Select from the **44 Styles**, colors and sizes in the famous new "Ranger" line of bicycles.

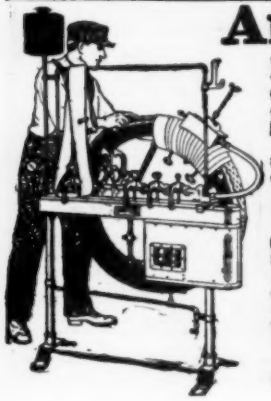
DELIVERED FREE on approval, express prepaid, for 30 days' trial. **No expense** to you if, after trial, you decide you do not wish to keep it.

12 Months to Pay Possession at once, on our liberal year-to-pay plan. You can easily earn the small monthly payments. **WRITE TODAY** for our *big catalog* showing our *complete line* of bicycles, **TIRES**, sundries and parts, and learn our wonderful *new offers* and liberal terms. **Do not buy** until you *know* what we can do for you. A postal brings everything. Write for it *now*.

MEAD CYCLE COMPANY DEPT. W-108 CHICAGO, ILL.

44 styles, colors and sizes. This is the RANGER Motorbike

An Easy Way to Make Money



Don't be content to plod along on a small salary. Be independent. Go in the tire repairing business and make $60 or more a week. One man made $45 the first day he received his outfit. **Others are making $25 a day and hundreds of wide-awake men are making $200 to $500 a month.**

No experience needed. We teach you how. Very little capital required. But slight risk, as every car owner in your town is a possible customer. Jobs are plentiful because tires blow out and puncture every day. Business is good the year round.

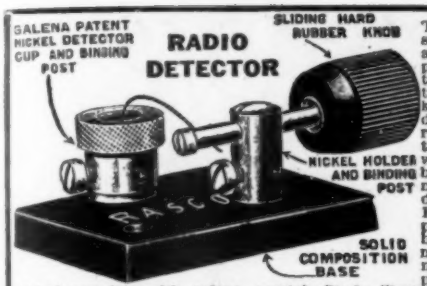
SHALER Tire Repair Outfit, $75

Will do as much and as perfect work as the big $250 to $500 vulcanizing outfits. A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has **Automatic Heat Control.** It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

WRITE FOR FREE BOOK "HOW TO OPEN A TIRE REPAIR SHOP" and complete Catalog, which gives full information.

WRITE QUICK BEFORE SOME HUSTLER GETS AHEAD OF YOU.

C. A. SHALER CO., 2011 Fourth Street, WAUPUN, WISCONSIN



This is the smallest and lowest priced detector on the market. It does a variety of things as well and better than many $5.00 detectors. Has composition base; all metal parts nickel plated; furnished complete with galena crystal. Study illustration and notice new features. Note particularly patent nickel detector cup and binding post. Size 1 ½ x 1 ½ x 1 inch. Sent prepaid anywhere. Price complete **50c**

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FOR FORDS

Charges 6-volt battery from Ford magneto. Attached to Ford in few minutes. Guaranteed to work perfectly. Hundreds in use. No more oil lamps, electrify your Ford. Price $6.95, postage prepaid. Send money order. Agents wanted. Write for circular.

WIZARD MFG. COMPANY
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CHAMPION

Dependable Spark Plugs

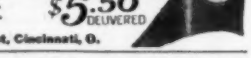
Champion Spark Plug Company, Toledo, Ohio

Champion Spark Plug Company, of Canada, Limited, Windsor, Ontario

DRIVE 100 TACKS AND SAVE $25.00

Easy to put on. We furnish instructions. We tailor top recoverings for all cars, and guarantee them to fit. Ford Roadster, $5.50; Touring, $6.95; other cars, $12.00 to $16.00, delivered at your door. Seat covers $3.10 up.

Write for Catalog and Samples



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Masonic Temple Chicago

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DEAFNESS IS MISERY

I know because I was Deaf and had **Head Noises** for over 30 years. My invisible Antiseptic Ear Drums restored my hearing and stopped Head Noises, and will do it for you. They are Tiny Megaphones. Cannot be seen when worn. Effective when Deafness is caused by Catarrh or by Perforated, Partially or Wholly Destroyed Natural Drums. Easy to put in, easy to take out. Are "Unseen comforts." Inexpensive. Write for Booklet and **my sworn statement** of how I recovered my hearing.

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—It gives valuable information about motor boat engines. It also describes the full line of L-A motors and tells of the 30 days' free trial plan. *Write for your copy today.*

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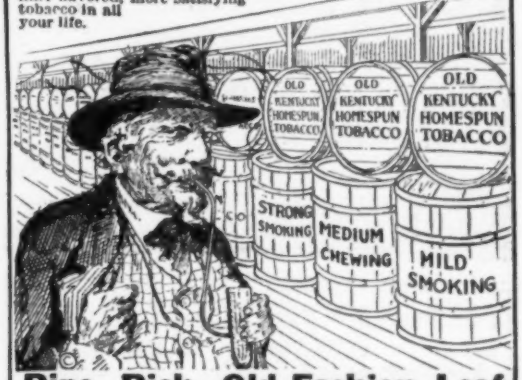
Direct From Our Farms to You

The Cream of the finest crops Kentucky's bountiful soil can produce—ripe, rich leaves—smooth and mellow—with that rare old-fashioned flavor and fragrance that only the proper "aging" can produce. We bank on it you have never tasted a finer flavored, more satisfying tobacco in all your life.



Ripe, Rich, Old-Fashion Leaf

Our Famous Old Kentucky Homespun is no more like manufactured tobacco than day is like night—guaranteed free from chemicals and all other adulterations that conceal imperfections, delude the sense of taste and undermine the health.

Grown and matured in Kentucky's finest soil, cut at the proper time, carefully selected, aged, mellowed, cured and "sweated" by the same method our grandfathers used in preparing tobacco for their own use—**every trace of harshness leaves it—nothing to "bite" your tongue or parch your mouth—nothing to tire your taste.** Mellow as the moonlight—fragrant as the rose. Like old wine from the cellar its rich fragrance permeates the air. Thousands of tobacco lovers the world over swear by its inimitable smoking and chewing qualities.

"For sixteen years I have used almost every brand on the market but yours is the best I ever tasted."—*W. E. Swires, St. Marys, Pen.*

"Tobacco satisfactory in every way. I now realize how foolish I have been—paying exorbitant prices of the middlemen instead of buying direct from the growers' association."—*C. J. Retslaff, Mondovano, Wash.*

"Say men, your tobacco is the best I have had since 1856 when Abraham Lincoln and I smoked together in the Sunny South. Tell all the old soldiers about it."—*John F. Stout, Libby, Mont.*

REDUCE YOUR TOBACCO BILL 75%

We are growers of tobacco and sell none but our own crops—our co-operative marketing plan eliminates all revenue tax—all middlemen—**you deal direct with the growers' association** thereby saving 75% or more. No fancy packages, no decorations—just **Quality** and lots of it.

MONEY SAVING PRICES

5 lbs. $2.98—10 lbs. $5.85

(We Pay All Shipping Charges)

6 pounds will make 55 big sacks of smoking, or 65 chewing or smoking twists. With each order we send complete illustrated instructions showing how to make granulated smoking, old-fashion chewing and smoking twists, cigars, etc.

WE PAY ALL SHIPPING CHARGES

Send No Money

Pay only when tobacco arrives. Try it for ten days—if it fails to please you—if it doesn't suit your taste—if for any reason you are dissatisfied, send it back and your money will be returned promptly without quibble or question. **You risk nothing.** Sign and mail the coupon today and enjoy the tobacco treat of your life.

Use the Coupon

TOBACCO GROWERS ASSOCIATION OF KY. MAYFIELD KENTUCKY

TOBACCO GROWERS ASS'N OF KENTUCKY,
Warehouse 522 Mayfield, Kentucky

Send me.....pounds of Old Kentucky Homespun Tobacco by parcel post prepaid. I will pay the price of $..... on arrival. If not satisfied after a 10-DAY TRIAL, I will return the tobacco and you will refund my money

Name.....

Address.....

Enter below pounds each grade wanted:

SMOKING:	—mild	—medium	—strong
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WHY SLAVE WITH COAL OR WOOD

Just turn a valve to cook or heat

3 TIMES THE HEAT WITHOUT COAL OR WOOD

The wonderful **Oliver Oil-Gas Burner** makes any stove a gas stove. Better heating or baking fire instantly. Saves time, money and drudgery.

CHEAPER THAN COAL OR WOOD The Oliver Burner makes its own gas from coal oil (kerosene), cheaper than coal or wood. Does not change your stove. Slips in or out of firebox in one minute. Absolutely safe. Protects health. Lasts lifetime.

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30 DAYS TRIAL Enjoy the conveniences of the Oliver for 30 days. You do not risk a cent. 100,000 satisfied users, many 10 years, say it is greatest comfort, money and labor-saver ever invented. See for yourself.

FREE Attractive Book telling all about the "New Kind of Heat," sent you free, postpaid. Also amazingly low introductory-price offer, including 30-Day Trial, if you act quickly. Write today. **Burns 95% Air—5% Oil.**

AGENTS $25 a day in spare time is easy. Write

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Oldest, Largest Manufacturers Oil-Gas Burners in the World

See our other advertisements on pages 6, 74 and 174.

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Dealers: Write for Accessory Catalogue

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Equip your old Ford or Chevrolet Chassis with one of our new distinctively modern bodies. Up-to-date Roadster, Touring and Speedster designs. Ford bodies as low as $29.50 and up. Territory open for live wire dealers and agents. Make real profits.

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AEROPLANES

Aeronautics offers the biggest and best field in the world to ambitious young men. Valuable education and fascinating sport.

Our new full size planes show you a side, top and front view of the complete model aeroplane. Numerous sketches and details show exactly how to cut and fit each part and make it easy for you to build and fly these accurate miniatures of famous aeroplanes.

NOW READY **LOENING RACING MONOPLANE** **S. E. "V" SCOUT BIPLANE**

The most complete and easiest understood model plane ever presented, on sheets 24in. x36 in., either set sent postpaid for **$1.00.** (State which you want.) Send 2c stamp and address of three interested friends for our new price list of guaranteed model aeroplanes and supplies.

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Guaranteed as represented or money refunded.

TIRE Agents Wanted

An auto owner in each locality to use and introduce **Mellinger EXTRA-PLY and CORD Tires**

Make big money part or full time. No capital or experience needed. Sample Sections furnished. **GUARANTEED**

8,000 and 10,000 Miles (No Seconds)

Hand made. Finest materials. Shipped prepaid on approval.

FREE ***Tires for Your Car*** to one user in each locality for taking a few orders. Be first to write quick for Special Agents Offer and Low Wholesale Prices.

MELLINGER TIRE & RUBBER CO.
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Worn-Out Tires worth $20 a Piece

Wonderful invention. Insyde Tyres—Inner Armor for automobile tires. Old worn-out casings will give 3 to 5,000 miles more service. Positively prevent punctures and blowouts. Guaranteed to give double tire mileage, any tire—old or new. Applied without tools, just slip inside casing before replacing tube.

CAR OWNERS SAVE $50 A YEAR

Will not heat or pinch. Use over and over again. Low priced. Over 100,000 satisfied customers. Write for special terms. Agents wanted.

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Constructed of finest steel. Just push the button and out comes the article you require. Worth $1.00. Postpaid

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10 in 1 — Adjustable Pencil, pen, paper knife, ink eraser, pencil sharpener, nail file and cleaner, mechanic's marking point, fine compass with screw attachment, foot rule.

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PLAYS ALL STANDARD RECORDS (PICTURE OF ONE)

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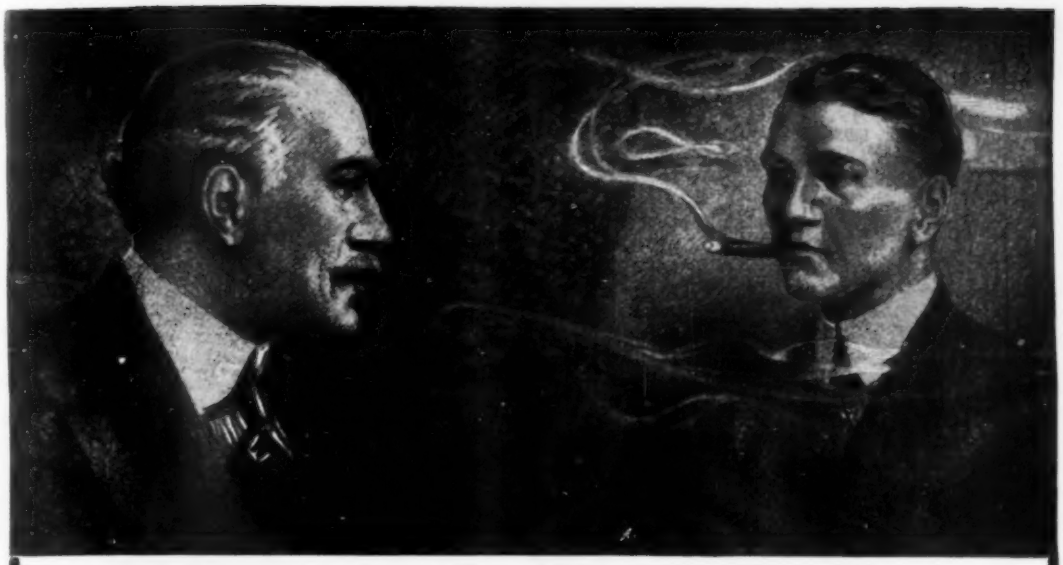

Tobacco Is Hurting You

Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For you know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but **sure.**

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco has undermined your system.

When your hands begin to tremble—
and your appetite begins to fail—
and your heart seems to "skip a beat" now and then—
and slight exertion makes you short of breath—
then you have a right to suspect that
TOBACCO is getting the upper hand.

Any well-informed doctor will tell you that these are only a few of many symptoms of tobacco poisoning.

And **YOU** know that the use of tobacco in **any** form is an **expensive,** utterly useless habit. You know you **ought** to quit.

Tobacco Habit Banished

Let Us Help You

It dosen't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

It is in no sense a substitute for tobacco. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves and make you feel better in every way.

Results Guaranteed A single trial will convince you. Our legal-binding, money-back guarantee goes with each full treatment. We will refund every cent you pay for the treatment if after taking it according to the easy-to-follow directions, it should fail to banish the tobacco habit completely.

SEND Coupon for Free Proof Let us send you our free booklet on the deadly effects of tobacco, together with testimonial letters from men all over the country telling how they have been absolutely freed from the tobacco habit by this simple home treatment. You could not ask for stronger proof that **Tobacco Redeemer** will free you from the habit than the evidence we will gladly send on request. Just mail the coupon—or a postal will do.

NEWELL PHARMACAL CO.
Dept. 300 **St. Louis, Mo.**

Free Book Coupon

NEWELL PHARMACAL CO.
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Please send, without obligating me in any way, your free booklet regarding the tobacco habit and proof that **Tobacco Redeemer** will positively free me from the tobacco habit or my money will be refunded.

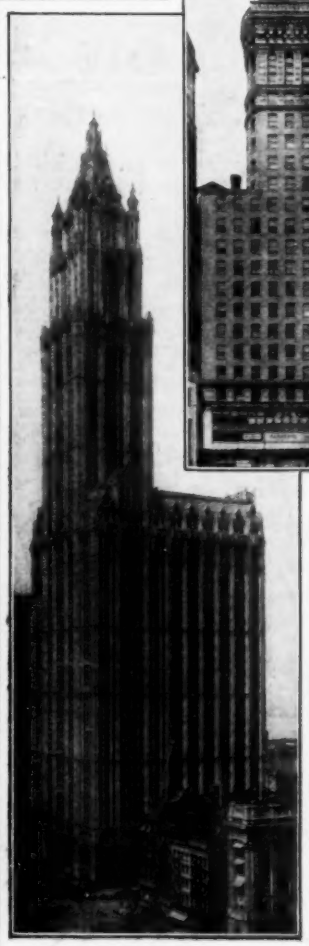
Name .....

Street and No. .....

Town ..... State .....

WASHINGTON

SAN FRANCISCO



NEW YORK

OUR SERVICE

Our Branch Offices

Our New York, Philadelphia, Pittsburgh, Chicago and San Francisco Offices

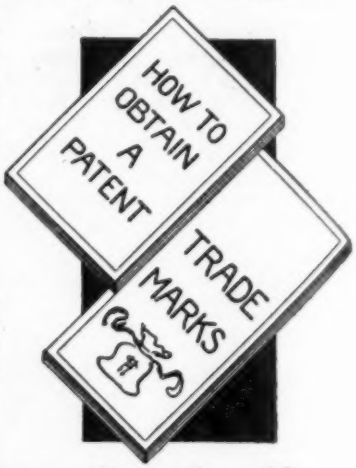
Owing to the growth of our business we have established for the benefit of our clients Branch Offices in New York City, Philadelphia, Pa., Pittsburgh, Pa., Chicago, Ill., and San Francisco, Cal. These branch offices being located in these large commercial cities, together with our Main Office located near the U. S. Patent Office, in Washington, enables us to more promptly handle the business of our clients, particularly as the branch offices are in constant touch with the Main Office and fully equipped to handle patent business in all its branches, patent litigation, interferences and infringements.

Our Four Books

Our Illustrated Guide Book

How to Obtain a Patent

Contains full instructions regarding patents, Trade Marks, Foreign Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described; Articles on Patent Practice and Procedure, and Law Points for inventors.



Our Trade Mark Book

Shows the value and necessity of trade mark protection and gives information regarding unfair competition.

Specialization---Our Staff

The field of invention is so vast that it is impossible for any one man to become an expert in all the different classes of invention. Only those practically skilled in the class to which the invention relates are capable of rendering efficient service. For this reason Victor J. Evans & Co. employ a number of patent lawyers and mechanical experts who have been selected for their special knowledge and ability in certain lines of invention.

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IN PATENTS

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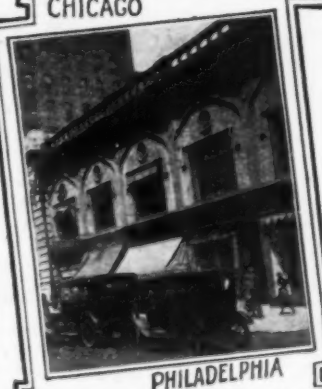

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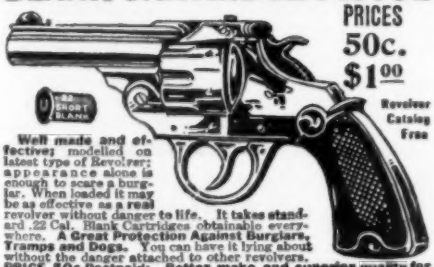

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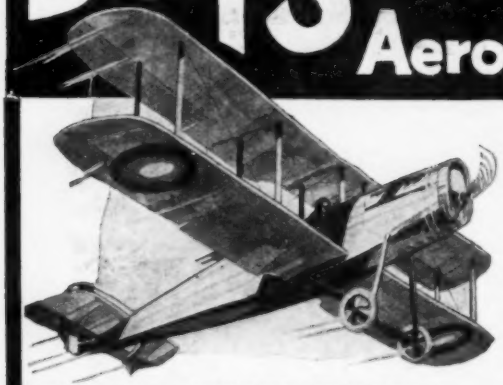

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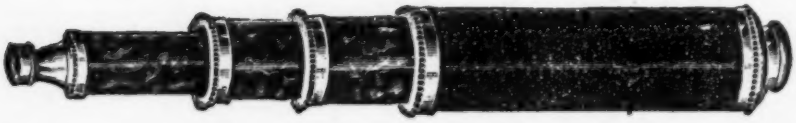

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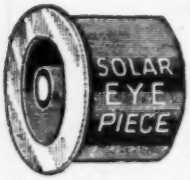

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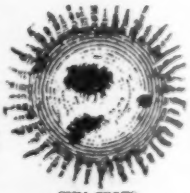

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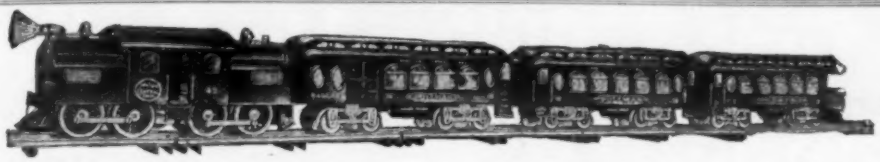

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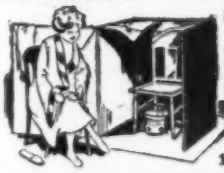

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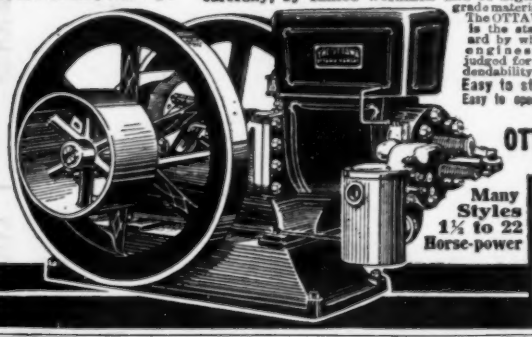

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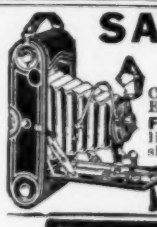

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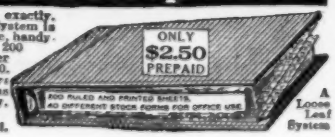

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$125 Weekly For Knowlton

With Willey Universal Vulcanizer

Robt. Knowlton started on $183.25. He is now making $125 weekly. He took our FREE course. The Tire Repair Business is all cash—only small capital to start—only small room needed—business comes easily.

We teach you the business FREE—either by mail or in our factory.

Willey Universal Vulcanizer
Sold on Installments

Burns coal, wood, gasoline, kerosene or gas. Economical to operate. Will handle $100 worth of work daily. Set up by anyone in 15 minutes. Fully guaranteed.

WILLEY RUBBER BOOT HALF SOLE MACHINE

Can be connected to regular vulcanizer or set up separate. Repairs auto tubes, water bottles, boots, rubbers, in fact anything rubber. Get Catalog, Free Course information—NOW.

WILLEY UNIVERSAL VULCANIZER CO.
32 WILLEY BLDG. BATTLE CREEK, MICH., U. S. A.

AGENTS $1.50 A Throw

THIS IS

A GOLD MINE at

Only 20 Boxes a Day Means $18 Daily Profit

Lucky 'Leven Combination in Display Case

Full size of box 6½x13¾ ins. Each article full drug store size. Retail value $3.25; you sell for $1.50-$2.00; costs you only 60c. Think of it! The array of fine toilet goods (that always appeals to milady's heart) will dazzle her eye, and when at the end of your spiel you state the low price of $1.50 for these 11 articles, the money is yours, even if she has to borrow, or beg it.

Act Now! Sells like hot cakes—men and women coining 10 to 20 dollars a day—a baby could sell "Lucky 11." Don't delay a minute. Each day's delay means big money to you. Sample outfit including Display Case will be sent postpaid for $1.50. Write for full details. Hurry! hurry! before it's too late. Act NOW.

E. M. DAVIS PRODUCTS CO., 2359 Davis Building, Chicago

DIAMONDS

Here at 60% of Market Price

This blue white perfectly cut diamond, 7-8 — 3-32 ct. at $52.50 among bargains last list. Many other big values in our lists. Buy *HERE*. Loan values the price basis, not market values. This 75 year old *diamond banking firm* has thousands unpaid loans and other bargains we must sell NOW.

Why Pay Full Prices

Any diamond sent for absolutely free examination at our risk. No obligation. No cost to you.

Send for Latest List

Diamond Bargains described in detail. *Tells of guaranteed loan values*, unlimited exchange privilege, details of free examination. No obligation. Just send name.

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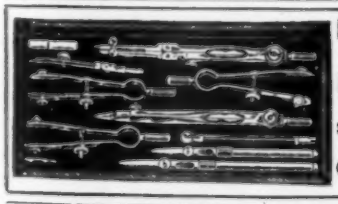
Only Opposite Post Office Pittsburgh, Pa.



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at Half Price

Shipped Prepaid, $6.00

Write for catalog.

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Guaranteed Genuine Leather 98¢

Bill Fold, Coin Purse, Card Case

The "American Bankroll" —1921 model. Beautifully made of **Black or Brown Genuine Leather.** Strongly stitched, neatest and most convenient pocket book you ever saw. 3x4 3-4 in. closed. Contains 48-page memo-diary full of useful information, and has separate pockets for coins, bills, cards, check book and photo or identification card (under transparent celluloid face). You couldn't buy this anywhere else for less than $2.00. A wonderful bargain at our special price of ONLY 98c.

23-Karat Gold Name Engraved Absolutely FREE

(City 30c. Street No. 30c, Fraternal Emblems 40c Extra) This attractive engraving gives the pocketbook an exceptionally rich and handsome appearance. This work alone is worth $1.50 of anybody's money.

Send No Money

Don't send us a penny in advance! Just send your name and address on the coupon and tell us what you wish engraved on the pocketbook. Then when you actually receive it, simply pay the postman our remarkably low price of 98c and postage (plus extra charges as shown if you want address, etc.) If you are not delighted and if you don't think this is the best buy you ever made, return it to us and we will refund your money at once, including postage. We have been selling these pocketbooks for over 15 years. You take no risk! Send coupon today!

U. S. Leather Goods Co., Dept. 1779 106-110 W. Lake Street Chicago, Ill.

Send me your Genuine Leather "American Bankroll" 1921 model pocketbook. When it arrives I will pay the postman your special price of only 98c and the few cents postage, plus extras I have checked below. If I am not more than satisfied I will return the pocketbook and you will return my money, including postage.

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St. No. ..... ☐ 30c extra

City ..... *State* ..... ☐ 30c extra

Emblem ..... ☐ 40c extra

Be sure to check color of pocketbook, and engraving you wish in addition to your name.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which applied to the surface of any article, **emits rays of white light,** rendering it **perfectly visible** in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles, make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, **price 25c.** Larger sizes, **50c** and **$1** postpaid.

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KWIK-EDGE SHARPENS RAZORS

Puts a keen, smooth cutting edge on dullest blades without honing. No grit. Will not harm finest razor. Money back if not satisfied. Send today. Year's supply **25c** stamps or coin. CLARK SPECIALTY CO., Dept. 112, Toledo, Ohio

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ADD TO YOUR INCOME WITH LITTLE EFFORT $5 to $10 A DAY MADE EASY WITH

"AMERICAN" Key Cutter

New Improved Green Automatic Machine

Sharpens, Hones and Strops all kinds of safety razor blades, in one operation, from four to six blades per minute. For both Quality and Quantity, this machine is in a class by itself. There is nothing like it on the market. Let us send you our descriptive literature explaining everything, including the "AMERICAN" Key Cutter—cuts square, angular or round slots.

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FOR ONLY FOUR $5 SALES A DAY

No Delivering—No Collecting—Commissions same day you take orders

AT LAST
A Simple Practical Dependable Extinguisher for only $5

FUGO Automatic Fire Extinguisher

MILLIONS OF PEOPLE want a handy, reliable fire extinguisher but they've held off paying $15 or $20. The **FUGO AUTOMATIC**—just patented—costs only $5 and is just as efficient, just as dependable as the highest priced. Everyone can afford one—agents take orders on every call. Nothing like it at the price—**a 5 minute demonstration sells it**—no talking—no arguments. An inexperienced agent can take 4 orders a day—others book 10 orders—easily. No competition—the field is unlimited. Customers so pleased they tell others—sales multiply fast.

NO EXPERIENCE NEEDED Our proved instructions guide you—you can't go wrong—a 5 minute demonstration and it's sold. Your neighborhood fire department will recommend it—boost it—push it.

EXCLUSIVE TERRITORY Become our licensed agent—employ sub-agents—each one brings you a good profit. You take no risk—you don't invest a penny. We deliver and collect—you receive commission same day you take orders.

THE OHIO INSTRUMENT MFG. CO.
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Get Our Plan—TODAY

You don't hear of an invention like this every day—don't delay. Trained agents will jump at this opportunity. **Write now for full particulars** showing big possibilities for YOU. Sample FugoAutomatic FREE.

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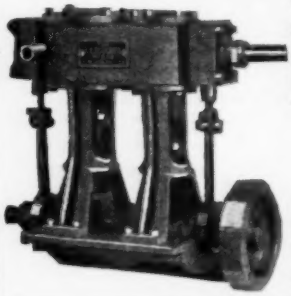

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Be A Floor Surfacing Contractor

Make $5,000 to $15,000 or More—Yearly

New, uncrowded field. Architects and general contractors know the American Universal and prefer its work. They prefer to sublet the floor surfacing contract, as it is a big business in itself. Business comes easily the American Universal Way. We furnish office forms, advertising, etc.— in fact we practically set a man up in a business of his own.

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Every building, large or small, is a prospect. Hundreds of floors right in your own vicinity need resurfacing. The owners will be glad to have you do it when you show them how easy and quickly the work can be done the American Universal Way. Old floors made like new—new floors made perfect.

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Save 30% to 60% Buy Now—

Beautiful Design
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WE DO NOT CLAIM THE WORLD

But every home in America or our nationally approved oil-gas burner. Fits any range, heater or furnace. We need 1000 salesmen to make each $225.00 and up per month—clear. Free equipment and sales plan.

Vapor Gas Burner Co.
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10 MONTHS TO PAY ONE CARAT $195.

SPECIAL LOW PRICES 30 DAYS TRIAL

Genuine blue-white diamonds now sold direct to you by DIAMOND IMPORTERS at wholesale prices **on credit at 40% discount.** 14 Kt. solid gold rings included free. Give finger size. **¼ carat only $48.75; ½ carat $97.50; ¾ carat $146.25.** If satisfied pay 1/5 down and balance in 10 monthly payments. *We guarantee to please you or return your money.* Order direct from ad. or write for 128-page bargain catalog of other jewelry.

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USE LIGHT WAVES

Measure gages, plugs, balls, wires, etc., in millionths of an inch.

Anyone can use this most practical and wonderful new measuring facility, the most accurate known.

To use light waves means advancement for the mechanic.

Write today for Circular M.21, giving valuable information, also our SPECIAL CHRISTMAS OFFER.

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AGENTS: $12 A DAY

New Kant-Klog Coal Oil Burner

Most perfect burner ever invented. Can't clog up. Burns 85% air and 15% gas. Turns any coal or wood stove into a gas stove. Pays for itself in a short time. Cheaper than coal. Big seller. Popular price. Write for Agency and territory.

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1000 SHOT ALL STEEL MAGAZINE AIR RIFLE FREE

WITHOUT COST

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Choice of Six Guns (on four easy plans) for selling our Magic Healing Wave-Lens at only 25c Box. WE TRUST YOU! Order Six Boxes Today On Postal Card—We send promptly, Prepaid! Easy to Sell—the Healing Ointment needed in every home! Sell at once, return money, as we direct, choosing your Gun according to one of the Plans shown in our Big Premium List. 200 Other Gifts! Or Big Cash Commission! Just for promptness a Free Gift—So ORDER TODAY!

350 SHOT REPEATING AIR GUN GIVEN

WAVERLY SUPPLY CO. 235 Tower Bldg. Monongahela, Pa.

A Big Raise in Salary

Is Very Easy to Get, if You Go About It in the Right Way

You have often heard of others who doubled and trebled their salaries in a year's time. You wondered how they did it. Was it a pull? Don't you think it. When a man is hired he gets paid for exactly what he does, there is no sentiment in business. It's preparing for the future and knowing what to do at the right time that doubles and trebles salaries.

Remember When You Were a Kid

and tried to ride a bike for the very first time? You thought that you would never learn and then—all of a sudden you knew how, and said in surprise: "Why it's a cinch if you know how." It's that way with most things, and getting a job with big money is no exception to the rule, if you know how.

We Will Show You How

Without loss to you of a single working hour we can show you a sure way to success and big pay. A large number of men in each of the positions listed are enjoying their salaries because of our help—we want to help you. Make check on the coupon against the job you want and we will help you get it. Write or print your name on the coupon and send it in today.

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Send me full information on how the **PROMOTION PLAN** will help me win promotion in the job checked.

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....Draftsman and Designer
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....Electric Light & Power
....General Education
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....Machine Shop Practice
....Photoplay Writer
....Mechanical Engineer
....Shop Superintendent
....Employment Manager
....Steam Engineer
....Foremanship
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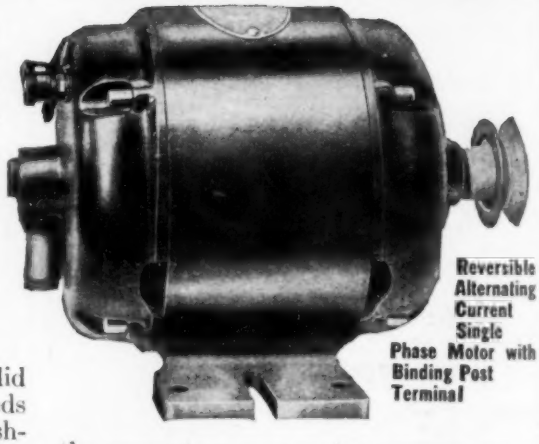
Xmas Bargain $11.75
¼ H-P. Electric Motor
Fully Guaranteed, As Low as

WE have only about 1,300 motors left, of the 10,000 factory overstock which we told you about last month; the following prices can be quoted only while this stock lasts:

100 lots, each	$11.75
25 lots, each	12.00
12 lots, each	12.25
6 lots, each	12.50
3 lots, each	13.00
Single motors	13.50

F. O. B. Chicago



Reversible Alternating Current Single Phase Motor with Binding Post Terminal

This is a motor that is giving splendid satisfaction to the owners of hundreds of thousands of electric household washing machines, churns, cream separators, ventilating fans, lathes, drills, grinders and similar devices. It is remarkably sturdy in construction, simple in design and efficient in operation.

Motor is ¼ hp (tested at factory for 50% overload) Single phase, 110 volt, 1740 rpm, 60 cycle split-phase induction type. Furnished in two styles as illustrated. In ordering, state which you wish.

ONE YEAR GUARANTEE

We guarantee every motor sold for one year (not six months, the usual custom). Each motor bears a **guarantee tag,** entitling the owner to a new motor, express prepaid, should anything go wrong with this motor within the first year of service.

A Motor in His "Stocking" At About 60% of Usual Cost

A million boys are this minute longing for an electric motor, to drive some pet contraption or to use in their amateur workshops.

Write out a list of all the boys whom you wish to make happy on Christmas, and decide which of them would rather have an electric motor than anything else you could give them.

Then send us an order for shipment of the motor described above; direct to the various addresses; enclosing a check covering the quantity price; as, for instance, $75.00 for six motors.

CASH MUST ACCOMPANY ORDER

or, you can have motors shipped to your own address by express C. O. D. if you prefer.

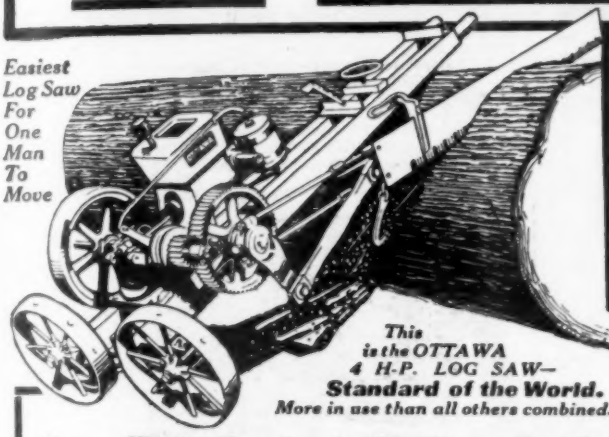
Non-reversible Single Phase with Cord and Plug Terminal

NORTHWESTERN ELECTRIC COMPANY
408 So. Hoyne Avenue CHICAGO

OTTAWA LOG SAWS

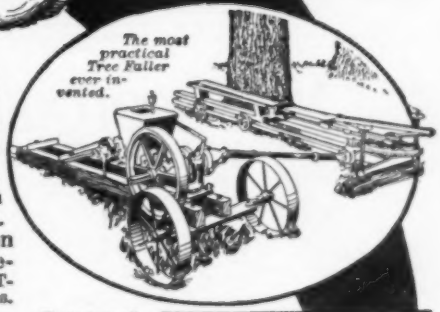
Now Selling at NEW LOWER PRICES

Easiest Log Saw For One Man To Move



The World's Standard Now Offered At Prices Any Man Can Afford Cash or Easy Terms

This is the OTTAWA 4 H-P. LOG SAW— ***Standard of the World.*** *More in use than all others combined.*



The most practical Tree Faller ever invented.

Own This Fastest-Cutting Outfit

Remarkable Money-Saving prices and very Easy Terms place this wonderful work-saver and profit-maker within easy reach of any farmer or woodsman. Thousands in use. 310 Saw Cuts each minute. Magneto equipped. Friction Clutch, Lever Control, Power Force Feed and all improvements. Get the OTTAWA — today! Get OTTAWA quality. Don't be satisfied with less.

One Man Cuts 36 Cords a Day

Read This: Our OTTAWA works good. With our OTTAWA we saw 36 cords of wood a day, and we never have trouble with the OTTAWA. I am starting to saw again this week. (Signed)
FELIX MARTINS,
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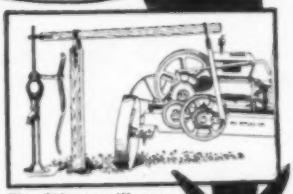
Made $255.25 Extra. "I like my log saw fine. I live in town and have to work for my living and since I got my OTTAWA Log Saw we can sure make our living. Last winter I took in cash money $255.25 in two months. Think of it. This winter I will make more. If anyone wants to know concerning your log saw, I will gladly send them a letter."
T. O. SHURSEN, Eagle Grove, Iowa.

The improved Ottawa Tree Faller is attached to the Log Saw in a few minutes. Quick change back to Tree saw.

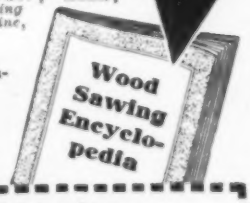


The Ottawa will run your Pump-jack, Grinder, Huller, Washing Machine, Etc.

Get Money Saving Offer! My New Reduced Prices and Special Terms of Payment make it easy for you to own an OTTAWA. Quickly pays for itself out of the profits it makes. Don't wait. Act today—get my Money-Saving Offer NOW!

FREE! Use the Coupon below, or a postcard and send for my 32-page Book in 5 colors describing OTTAWA Log Saws and One-Man Saw Rigs. A real encyclopedia on Wood Cutting. SEND TODAY!

OTTAWA 4-H-P One-Man Saw Rig for Sawing limbs and branches. Friction Clutch. Starts and Stops Saw Blade. Magneto Ignition. 20-inch Cut-off Saw. Complete as pictured. Sold with Log Saw or without Log Sawing attachment.



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Name.....

Address.....

Send No Money

for this 25 Cal. regulation blue steel Automatic Revolver

Pay the Postman only $9.75 and postage when the revolver is delivered. We guarantee full satisfaction or Money Back.

After Examination

Keep one of these brand new safety revolvers in your home and be fully protected against burglars, thieves and hold-up men. It's a terrible fright to wake up in the night—hear noises down stairs or in the next room—and realize your neglect has left you wholly UNPROTECTED. One of these revolvers will fully protect you.

Shoot Quick

7 Shots in 3 Seconds

Just pull the trigger. Each shot automatically ejects the cartridge and loads ready for the next shot.

This revolver HAS DOUBLE SAFETY and is practically "fool-proof" against accidents. Perfect grip, accurate aim. Handsome blue steel gun metal finish. Rifled barrel, checkered grips, safety lever. Holds 7 cartridges. Small, compact, fits in vest pocket, lies flat and will not bulge out pocket. Shoots famous Colt Auto Cartridges. Fine for target practice.

SEND NO MONEY Order today. Just send your name and address and say which revolver you want.

No. 354 is 25 cal., 7 shot. Regular price $22.50. Our price, ... **$9.75** and postage

No. 754, 32 cal. military model, 10 shot, extra mag. FREE, making 19 shots in all. Special price, ... **$12** and postage

Don't wait. Order these bargains today. Write clearly your name, address and the Number of the Revolver you want to order. Send No Cash. We ship by return mail. Pay Postman on arrival our price, plus postage. Send for free catalogue.

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Security and PROTECTION

$17.50 Actual Value $35.

Has popular swing-out cylinder, made by expert mechanics, of extra fine steel. Nickel or blue finish. Pearl handles, $3.00 extra.

SEND NO MONEY Order to-day. Send your name and address and number of revolver you want. No. 1052, 32 cal., $17.50. No. 1552, 38 cal., $19.00. Pay postman our price, plus postage.

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TIRES **BEST VALUES EVER OFFERED**
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Used tires. Other sizes just as low. Cords and fabrics. Send no money. Return tires if not satisfactory when received. State if you want s.s. or cl. Supply limited at this price. Order quick.
ROYAL TIRE & SUPPLY CO., 1461 MICHIGAN AVE., DEPT. P, CHICAGO, ILL.

$375.75 One Day!

Ira Shook, of Flint, Did That Amount of Business in 1 Day

—making and selling **Popcorn Crispettes** with this machine. He says in letter dated March 1, 1921: "I started out with nothing, now have **$12,000.00** all made from **Crispettes.**" Others have amazing records: Gibbs says: "Sold **$50.00** first night!" Erwin's little boy makes **$35.00** to **$50.00** every Saturday afternoon. Meixner reports **$600.00** business in one day. Kellogg writes: "**$700.00** ahead first two weeks." Master's letter says: "—sold **$40.00** in four hours." During March, 1921, Turner was offered **$700.00** clear profit above cost of his investment to sell. **There is money**—lots of money—in **Crispettes.** Times make no difference for most of these records **were made in 1921**—were made while people are crying **hard times** and are **looking for jobs!** Location makes no difference. It's common for **Crispette** machines to make **$10.00** to **$25.00 profit daily** in small towns!

I Start You In Business

Write me—get my help. Begin now. Others are making money selling **Crispettes.** You can, too! You don't need much capital. Experience not necessary. I furnish everything—secret formulas, equipment for shop or store, full directions, raw materials, wrappers, etc. Splendid chances galore everywhere! Crowded streets, amusement parks, concessions, wholesaling and stores!

$1,000.00 Monthly Easily Possible

Crispettes are a **delicious, delightful confection.** People **never get enough.** Always **come for more.** Raw materials are **plentiful** and **cheap.** You make **enormous profits.** Trade grows by **leaps and bounds.** It's an **easy, pleasant** and **fascinating** business. Send post card for illustrated book of facts. Contains enthusiastic letters from men and women who have **quickly succeeded** Tells how to start. Explains most successful methods. Gives all information needed. It's FREE! Write Now! Address

LONG EAKINS COMPANY
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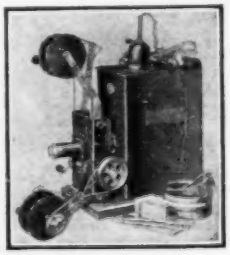
HERE IS THE CHRISTMAS GIFT

A Genuine Moving Picture Machine

that anyone can operate anywhere. Uses big theatre films.



THE MOVIEGRAPH (patented)
Model 260—Wt. 8¼ lbs.

Six wonderful models from $3.00 to $25.00 with films, post free. Just imagine the fun you can have at home with a MOVIEGRAPH. Run your own shows and even make money. Be up to date!

We also sell films of best subjects, as CHARLIE CHAPLIN, MARY PICKFORD, etc., etc.

Write to-day for big free illustrated catalogue and film price list.

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Dept. M,
P.O. Box 1371, Boston, Mass.

You Real Sport Lovers—

—you who know the thrills of ice boating, tobogganing, skiing, hunting, ice fishing,

—you will appreciate the sport of winter motorcycling. The feel of super-power under your control, as your Harley-Davidson whirls over the snow-sheathed trails, sure-footed and wind-swift, carrying you and your pal comfortably and cheaply to haunts you never could reach by automobile!

You can afford a Harley-Davidson. Its upkeep averages only a dollar per 50 miles for gasoline, oil and tires.

Harley-Davidson prices have been cut 25%. Ask your dealer for free demonstration—or write us for literature

Opportunity for dealers in unassigned territory. Write for details.

HARLEY-DAVIDSON MOTOR CO.
MILWAUKEE, WISCONSIN

Harley-Davidson

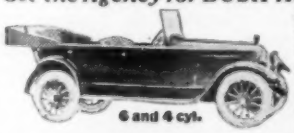
World's Champion Motorcycle

TIRRO

the ideal mending tape of a thousand uses—sticks to anything and stays stuck. For sale at all druggists. A Bauer & Black product.

MAKE MORE MONEY

Get the Agency for BUSH Automobiles for 1922



6 and 4 cyl.

Open and closed cars. Start today to make more money in 1922 than you did in 1921. You can with good cars at low prices. Get all information quick. Write TODAY.

BUSH MOTOR CO.
Dept. 12, Bush Temple, Chicago

If You Can Tell it from a GENUINE DIAMOND Send it back

To prove our blue-white MEXICAN DIAMOND cannot be told from a GENUINE DIAMOND and has same DAZZLING RAINBOW FIRE, we will send a selected 1 carat gem in ladies Solitaire Ring. (Cat. price $5.26) for Half Price to introduce, $2.63, or in Gents Heavy Tooth Belcher Ring (Cat. Price $6.50) for $3.25. Our finest 12k Gold Filled mountings. GUARANTEED 20 YEARS. SEND NO MONEY. Just mail postcard or this ad, State Size. We will mail at once. When ring arrives deposit $2.63 for Ladies ring or $3.25 for Gents with postman. If not pleased return in 2 days for money back less handling charges. Write for Free catalog. Agents Wanted.

MEXICAN DIAMOND IMPORTING CO., Dept ET, Las Cruces, N. Mex.
(Exclusive controllers Mexican Diamonds)

WHY MAKE BEARINGS

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SAVE time, money, worry. 153 sizes completely finished Straight Bronze Bearings always in stock. Every size you need. Small lots at big run prices.

Cored Bronze Bars in 16 stock sizes.

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HB Buy Your Battery Charger NOW on Easy Payments

$20 Puts an HB Charger in Your Shop

Pay balance on long easy monthly terms. Dependable, money-making service—no repairs or renewals. Start NOW, when winter brings best demand for reliable battery service. Sizes for 10, 16, 32 or 70 batteries. Let us recommend size to make you most money. Write us TODAY.

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$150 to $300 Clear Monthly Profit

PROF. HENRY DICKSON
Foremost authority on Memory Training and Principal Dickson Memory School.

SEND NO MONEY

Just a postcard. I will send you my new, complete, revised course in

CHARACTER READING—PSYCHO-ANALYSIS

for five days' free examination. Most lucid, practical instruction on this subject. 50 years' experience put into this course. Shows you how to read character—to "size others up," to

KNOW YOURSELF

Eight persons out of every ten are in the wrong job, **are you?** For what are you best fitted? Can you overcome your weak points? Are you easily discouraged? Are you getting on?

BE MASTER OF YOUR DESTINY

instead of its victim! Overcome your failings, dominate circumstance. **Get the job you want at the salary that's right!**

THROUGH MY CHARACTER READING COURSE

Secrets are revealed that took me a life-time to penetrate. Your hidden powers are developed, your influence made vital, you find what type of persons to cultivate as friends, what type to avoid, **what type you should marry.**

ON APPROVAL

This lavishly illustrated Course, with photographs, diagrams and charts, showing types, characteristic and composite, with their traits; the significance of profile contour, the concave, convex and plain, and PERSONAL SELF-MEASURING EFFICIENCY CHART ANALYZING YOUR OWN CHARACTER, all this sent for 5 days' examination free. If not satisfied, simply return it to me. When, however, you realize that the Course can be a turning point in your career, then remit $2.00 which pays for the Course IN FULL (no extra charges of any kind) and secures also personal instruction privileges and an analysis of your own character FREE. Address

PROF. HENRY DICKSON
1041-K Chicago Ave. Evanston, Ill.

Agents

"Ye Gods, —some seller! I made $215 to-day"
-writes Bentley

The Oliver Oil-Gas Burner does away with coal and wood. Turns any range, furnace or stove into an oil-gas stove. 18 different models. Burns kerosene (coal oil). Gives much or little heat by simply turning valve. Think of the appeal you can make in every community. Solves fuel problem. Cheaper than coal, wood or gas—absolutely safe. Does away with drudgery—no fires to make, no ashes, dirt, smoke, chopping, carrying coal and wood. Easy to install. Doesn't change stove. Protects health. Easy to demonstrate—slip in or out of stove in one minute. Show any woman what it will do right in her own home and the sale is made. Big demand all year. Let low price of oil make you big money.

Big profit. Some Oliver agents earn as high as $1,000 a month. $21 a day is easy. Burns 95 per cent Air—5 per cent Oil

FREE SAMPLE CASE OFFER

Write at once for it and Free Detail Literature.

OLIVER OIL-GAS BURNER & MACHINE COMPANY
Oldest, Largest Manufacturers Oil-Gas Burners in the World.
2048-L Pine Street. ST. LOUIS, MO.

See our other advertisements on pages 6, 74 and 156.

GET A BIG, FAST, 24 INCH RACING AEROPLANE

$1 Postpaid

A real Racing Aeroplane that will fly far, fast and high. 24 in. long; single propeller type; strong and sturdy. The biggest value ever offered in a Flying Racing Aeroplane; special to introduce the IDEAL-O-PLANE to all boys. Get one now; have days of real sport. Guaranteed to fly. Send $1.00 right away and get yours by return mail. Denver, Col., and West, also in Canada, $1.25. **Ideal Aeroplane & Supply Co., 159 Wooster St., Cor. West Houston St., N. Y. City.**

Build and fly your own model of a famous aeroplane. IDEAL models are easy to build and fly like real 'planes. Send 5c for 48-page catalogue of model aeroplanes and supplies.

10 Cents

Worth of Common Ordinary KEROSENE

or **Coal Oil** will keep this lamp in operation for **30 HOURS** and will produce

No Wicks to Trim
No Smoke
No Smell

300 CANDLE POWER

of the purest, whitest and best light known to science. Nothing to wear out or get out of order. Simple. Safe. Absolute satisfaction guaranteed. Send for catalog showing lamps for every purpose; also special introductory offer and agency proposition. Write today.

KNIGHT LIGHT CO.
Dept. 1359 Chicago, Ill.

The "BEST" LIGHT

Positively the cheapest and strongest light on earth. Used in every country on the globe. Makes and burns its own gas. Casts no shadows. Clean and odorless. Absolutely safe. Over 200 styles. 100 to 2000 Candle Power. Fully Guaranteed. Write for catalog. AGENTS WANTED EVERYWHERE.

THE BEST LIGHT CO., 324 E. 5th St., CANTON, O.

Build This Phonograph Yourself

TREMENDOUS SAVING IN COST

Easy, fascinating work with our SIMPLIFIED PLANS. We furnish blue prints, diagrams, motor, cabinet pieces, ready-built horn, etc. You don't need to be a cabinet maker. A few hours assembling and you will have a fine instrument at *one-quarter the regular retail price.* **AGENTS MAKE MONEY** making and selling these instruments. Write today for full details of our FREE OFFER. Address:—

Modern Phonograph Supply Co.
630 Springer Bldg., 313 S. Clinton St., Chicago, Ill.

300 AGENTS WANTED—$50 TO $120 A WEEK

Millions of women want the New Grip-On Easy Cover Ironing Table. Agents taking orders at every house. Nothing else like it. Sells on sight. Make $20 a day and up. $10,000 a year easily possible for hustlers—men or women.

Grip-On Easy Cover Ironing Table Advantages
Can't wabble. Will hold man's weight on extreme end. No pinning; no tacking, no sewing of sheet or pad. Instant attachment. Use any old sheet or padding—smooth, tight ironing surface. Long open end for ironing skirts. Sets up with one operation. Folds, hangs up, etc.

No Experience Needed

Curiosity to see the table gets you opportunity to demonstrate everywhere. No talking or arguments. Needn't know a thing about selling. Just set table up. Let the woman see its advantages. She'll grab the chance—buy on the spot. And she'll tell her friends. Every sale starts an endless chain of additional sales.

Make $10,000 a Year

Get exclusive territory free! Start! Follow proved instructions we give you. Make $20 first day. Repeat. Then get help! Employ others. Become a general agent.

Read These Proofs

H. L. Harmon says: "Am putting on six subagents. Send 200 tables at once." J. M. Craig, former $25 clerk, says: "I want two counties, exclusive rights, I can make $6000 next six months." A. C. Mitchell writes: "Made $45 first two days—more than my former weekly pay. Can hardly realize it."

Free Plan—Write at Once

Don't delay an instant. Send for application blank and complete information today—free. Get ahead of others in your territory. Trained agents will jump at this opportunity. Some wire us! Every application treated impartially—first come, first served. Territory exclusive. ACT NOW! ADDRESS—

GRIP-ON IRONING TABLE CO., 313 SOUTH CLINTON STREET, DEPT. 111, CHICAGO

A FINE MUSICAL INSTRUMENT

THE FLUTA ACCORDEON

Loud and Clear **Wonderfully Easy to Play** **Very Sweet Tone**

LENGTH 13 INCHES

The Same Fingering as Any Accordeon

Price $2.50 **With a Number of Popular Tunes and Full Directions, Packed in a Neat Box. We Pay Postage Anywhere.**

THE Fluta Accordeon is a great improvement upon most reed wind instruments. It is very easy to play. Anyone who can read ordinary print can understand the Special Book of Popular Tunes, that has **no notes** at all, only figures, that enable anyone to play without knowing anything about music. You have merely to press the keys according to the numbers, at the same time supplying the wind through the mouthpiece, and you hear the tune, with a full and rich accompaniment of tenor and bass chords. You don't know just how you do it, but the music is loud and clear, yet exceedingly pleasant and harmonious, like a little band. In ordinary accordeons the bellows needs careful management to keep up the supply of wind; the Fluta has always plenty of wind. The bellows is also the weak part of ordinary accordeons, that usually wears out first. The Fluta has no bellows to wear out. The Fluta Accordeon is constructed of absolutely **damp-proof** materials and the reeds are set in **moisture resisting** cement, thus the breath when playing will not clog the reed plates and spoil the instrument, as so often happens with mouth organs and blow accordeons. Herr Weiss, the manufacturer, adopted this improved principle in compliance with many requests. The case of the instrument is very strongly made of a kind of papier mache, that is practically indestructible; it will last a long life-time with reasonable care. The keys, the mouthpiece and the trumpet are of metal, heavily nickel-plated, and the valves are covered with the softest leather, making them perfectly air-tight. When playing, both hands are used in the most natural and easy manner, so that rapid fingering for fast dance music, such as reels, jigs, hornpipes, etc., is not at all difficult, as it is with most instruments. Altogether the Fluta Accordeon is certain to become as popular here as it has elsewhere. You should order at once. Remember, the price is only **$2.50,** for which you get the Fluta Accordeon with full directions, and the Special Selection of Popular Tunes, carefully packed in a neat box and delivered anywhere without further charge.

JOHNSON SMITH & CO., Dept. 731, 3224 NORTH HALSTED STREET, CHICAGO

"NOKEE" LOCK

KEYLESS ***NO KEY NEEDED***

Cannot Be Unlocked Unless You Know The Combination

EVERY COMBINATION DIFFERENT

These clever Locks resemble the "combinations" on the high class burglar-proof safes. They can only be unlocked when you arrange the letters in a certain order. **Each lock has a different word,** the secret of which we send with the lock. It is a lock with no key to lose. Whether it is securing your locker, your motorcycle, your boat, your tool chest, your mail box or any other of a thousand uses, **"Nokee" Lock** will be found practical and effective. In addition to having so many uses, it will afford much interest and entertainment in baffling the attempts of all those who, without knowledge of the combination, try to open it. You can have great fun slipping one of these locks on to somebody or something; it cannot be removed until you are ready. It is simplicity itself to open when you have the combination, but impossible otherwise. It is exceptionally strong and beautifully finished; a striking and useful novelty weighing but two ounces, that can be carried as a pocket piece and used in many emergencies. **ONLY 50 CENTS POSTPAID**

JOHNSON SMITH & CO., **DEPT. 731, 3224 NORTH HALSTED STREET CHICAGO, ILLINOIS**

BE AN EXPERT AUTO ELECTRICIAN

Auto Mechanics—Increase Your Pay and Earn Advancement

Here is the great secret of success, for 9 out of 10 auto mechanics are weak on electrics, while 75% of car troubles come from the electrical end. Our course teaches electricity thoroughly and practically in every detail.

Are you puttering along as an auto mechanic, thinking you know the business? But do you really know it? Why not check up your knowledge and prepare yourself for a step ahead? Good jobs are scarce and a man must know more to get ahead. Special advanced training at the Michigan State Auto School, in Detroit, the auto center, will make you an expert auto electrician, will assure you of a good job anywhere, at any time.

Be an Expert in Automotive Electricity

If you are a good mechanic you can be a better one by knowing electrical work completely. There is a serious need in every town and city for men who can tell definitely what is wrong with the electrical systems of cars, trucks and tractors, and can make the repairs properly and quickly.

Special Course for Garage Men

More Auto mechanics must go after the electrical end and master it to meet the need. This school now offers a special **Advanced Electrical Course.** This is not elementary instruction but highly specialized advanced work for a specific purpose—to train electrical experts.

We Have Added Another Big 3-Story Building

So great is the need for real automotive electricians that we have increased our training capacity and added a big three-story building. The most extensive and up-to-date electrical equipment is here for you to work on. Expert instructors are here to give you individual instruction in each branch of the work.

Outline of Course

The course includes scientific teaching and experiments of electrical operation, induction, magnetism, regulation, circuits, etc. The student has actual practice in testing, wiring and adjusting every type of starting, lighting and ignition system; also overhauling all systems; tearing down and assembling; operating them on live motors; trouble shooting on live cars; building and repairing of storage batteries; armature winding; farm lighting systems. This course is advanced work and will enable experienced mechanics to do better work and earn better salaries—to reach the top.

Life Membership

Life membership with privilege of our service free at any time, is included with your enrollment here.

Our position in the center of the Auto Industry, and the cooperation of the leaders in this industry, enable us to offer quality training at a lower cost than less efficient training is given for. Ask about this.

Send for 188-Page Catalog

This book tells in detail about M. S. A. S. training, methods and equipment. It includes letters from graduates telling what this training has enabled them to do, and letters from leaders in the auto and tractor industry endorsing our methods. There is no obligation in sending for this catalog. It will tell you more about the opportunities for trained men in the great automobile business, and what the M. S. A. S. can do for you.

We will gladly reply to personal letters and answer questions fully. Write today.

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A. G. Zeller, Pres. and Gen. Mgr.

THE FACTORY ENDORSED SCHOOL

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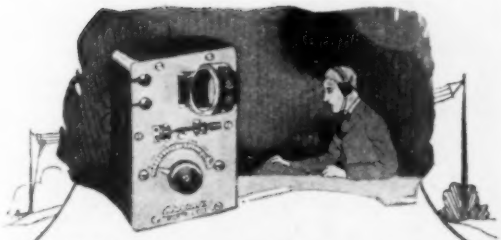
DETROIT, MICH.



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LISTEN in on the world's news by wireless. This Climax Unit picks up both wireless telegraph and telephone. Simple to operate, sure of results. No battery, no license, no experience needed. Send five cents today for your copy of the new bulletin describing the complete line of

CLIMAX
RADIO RECEIVING UNITS

You can put up a working station, and get results in less than an hour. Address:

Wireless Equipment Co., Inc.
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Mystic Skeleton

A jointed figure of a skeleton 14 in. in height, will dance to music and perform various gyrations and movements while the operator may be some distance from it. **10c pd.**

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which darts and twists about in a most lifelike manner. **Price per box, 10c ppd.**

Good Luck Ring

Quaint and Novel Design

A VERY striking and uncommon ring. Silver finish, skull and crossbone design, with two brilliant, flashing gems sparkling out of the eyes. Said by many to bring Good Luck to the wearer, hence its name, **Good Luck Ring.** Very unique ring that you will take a pride in wearing. **ONLY 25 CENTS.**

JOHNSON SMITH & CO., Dept. 732, 3224 North Halsted Street, CHICAGO

Latest Automobile Accessories-Wholesale

SAMPLE BARGAIN

Guaranteed Best Quality Radiators For Fords $13.85

Specify Year in Ordering

Buy Here and Save Money

On "Fidelity" Bodies, repair parts, tops, radiators, fenders and general accessories for Fords and other cars, all guaranteed standard quality.

Send for Big "Nemco" Catalogue, FREE! Know what you should pay before you buy. Send for the Nemco Price List, it is absolutely free, and be sure you are getting the lowest prices. Every page of this book is filled with bargains. We buy for cash and sell for cash.

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Buy Your Xmas Gifts Now

Only a few cents a day

No Money Down

JUST send your name and address for our 128-page book of diamonds, watches and jewelry on credit. Millions of dollars worth of jewelry from which to choose your Xmas gifts. Your choice sent **you on approval, without a penny down.**

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Don't send a penny in advance. Your simple request brings any diamond or piece of jewelry you choose. When it comes examine it and, if it is not the greatest bargain you have ever seen, send it back at our expense. If you decide to keep it, you can pay at **the rate of only a few cents a day.**

8% Yearly Dividends

You are guaranteed an 8% yearly increase in value on all diamond exchanges. Also 5% bonus privilege.

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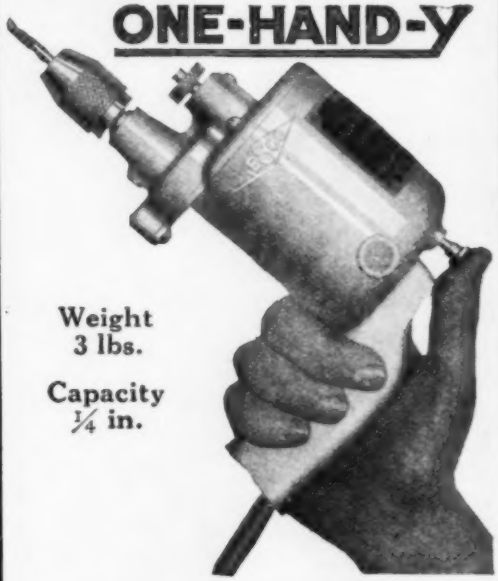
Send your name and address *now*. No obligation. Beautiful Xmas catalog comes free by return mail. Explains all about Lyon Charge Account Plan. See this great collection of jewelry bargains now. **Send your name for catalog today to Dept 1779**

J·M·LYON & CO.
1 Maiden Lane, New York, N.Y.

Do it with the

ONE-HAND-Y



Weight
3 lbs.

Capacity
¼ in.

The Light, Reliable, Convenient ONE-HAND-Y Electric Drill

Application

For drilling holes ¼" and smaller in wood or metal. Particularly adapted to all branches of the woodworking, sheet metal and automotive industries.

Ease of Operation

So light—3 pounds—that it can easily be carried to the job; its balance is so perfect that it can be handled as easy as a pistol and it can be used constantly without tiring the operator.

Cost

It so materially reduces drilling expense, that the high quality and excellent results obtained linger long after the extremely low cost has been forgotten.

Motor

Westinghouse, Universal Type, 110, 220, and 32 volt AC and DC. Air cooled. Ample power controlled by switch always under thumb.

Guarantee

The ONE-HAND-Y—the lightest electric drill on the market—is guaranteed against defective workmanship and material.

Write nearest office for details

Knight Engineering & Sales Co.

30 West Walton Place, Chicago, Ill.

210 W. Seventh Street, Los Angeles, Calif.

Comfortable Portable

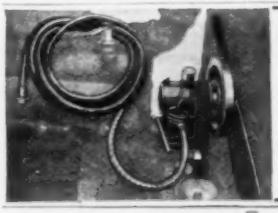
The 1922 Elto is now ready—

Ole Evinrude's new motor, his greatest achievement! Two-cylinder construction, only 47 pounds. Practically vibrationless, starts easily, tilts automatically; 19 exclusive features explained in the Elto booklet. Write for it today.

ELTO OUTBOARD MOTOR CO.
OLE EVINRUDE, Pres.
Dept. A, Mfrs. Home Bldg.
Milwaukee, Wis.

Elto

Light Twin Outboard Motor



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The **A.I.D. Air Unit** pumps a Ford tire in less than 5 minutes.
Aero Fan keeps motor cooler—any one can attach.
A Real Tire Pump — no gears, cams, chains or noise.
Agents Wanted. Send for Circular

A. I. D. Inc.
1352 Beacon St., Boston 47, Mass.

ONLY $37.85

Write for circular

Six Machines in One

— bench grinder, polisher, buffer, sander, drill and saw, for working in wood and soft metals.

Handles 4" and 5" grinding wheels; 5" and 6" saws; 4", 6" and 8" sand and emery paper discs and 3-8" chuck. Top easily removed, or tilted for sawing and grinding. Mountable on separate base with motor, or driven from counter shaft. Extremely compact; highly serviceable; decidedly practical. Not a toy. Height 10"; weight 31 lbs. Suited for Printers, Cabinet and Pattern Makers, Musical Inst. Mfrs., Furniture Repairmen, Shipping Depts., Manual Training Schools, Laboratories, Private Shops, etc.

W. & J. Boice, 114 23rd St., Toledo, Ohio.

NEW LAMP BURNS 94% AIR

Beats Electric or Gas

A new oil lamp that gives an amazingly brilliant, soft, white light, even better than gas or electricity, has been tested by the U. S. Government and 35 leading universities and found to be superior to 10 ordinary oil lamps. It burns without odor, smoke or noise—no pumping up, is simple, clean, safe. Burns 94% air and 6% common kerosene (coal oil).

The inventor, L. D. Johnson, 609 W. Lake St., Chicago, is offering to send a lamp on 10 days' FREE trial, or even to give one FREE to the first user in each locality who will help him introduce it. Write him today for full particulars. Also ask him to explain how you can get the agency, and without experience or money make $250 to $500 per month.

Burlington 21 Jewels

A FEWER number of jewels not worthy of the name Burlington. The masterpiece of watch manufacture—Adjusted to the Second—Isochronism—and Positions—25-Year Gold Strata Case.

We send the 21-jewel Burlington for you to look at and examine carefully before you buy. This is the only way a Burlington Watch is ever sold. Send for the free book now.

Sent On Approval

We will send you the 21-jewel Burlington for your approval (without any obligation on your part to buy) and besides we offer you very special terms, after Free examination, of small monthly payments. A 21-jewel Burlington watch sold to you at a price much lower than that of other high-grade watches. Send for the most complete watch book ever produced. The book is free. Send now.

See It First

BURLINGTON WATCH COMPANY
Dept. 1359, 19th St. and Marshall Blvd., Chicago

Please send me your free book on watches with full explanation of your approval offer on the Burlington Watch.

Name .....

Address .....

Telephone That Talks

Not a toy but a real telephone. Can be used to talk great distances, both indoors and outside. Ideal for the home, the camp or hike. Nothing like it. Furnishes unlimited enjoyment for boys and girls. Can be a temporary or permanent installation in your home. Will operate over 500 feet.

Only $1.00 Post Paid

This remarkably low price holds good for a limited time only—to introduce this outfit. Set contains two complete stations, two transmitters, two receivers, connecting cord and complete diagrams and instructions. Tells you how to install your telephone system in 10 minutes. Order your "Telephone That Talks" today. Enclose only $1.00.

Money-Back Guarantee: If, after you have tried this phone for 5 days, in your own home, you find it doesn't do all we claim for it, or it is unsatisfactory for any reason, return it to us and get your money back in full. Send $1.00 for your phone set today. Do it NOW!

INLAND SPECIALTY COMPANY
Dept. 12, 2307 West North Avenue, CHICAGO

STORAGE BATTERIES

GUARANTEED 18 MONTHS

½-Price - - Save 50%

Engineers have tested and approved

TRIPLEX QUALITY

TRIPLEX batteries now shipped direct from factory to car owner. Prices cut exactly in half. Standard eighteen month guarantee given in writing. Never before have these batteries been sold at this price.

Cash With Order—Save Return Charges

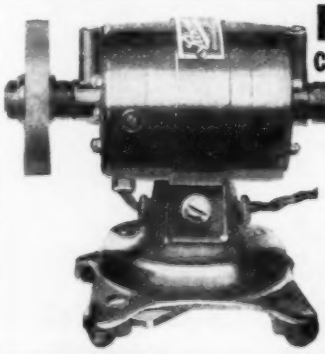
Specimen Prices—Including War Tax—F. O. B. Chicago

6-volt, 11-plate—standard for FORD, DORT, CHEVROLET (4-90)	$16.40
6-volt, 13-plate—standard for BUICK, OVERLAND	18.60
12-volt, 7-plate—standard for DODGE, MAXWELL (2 or 4-wire)	21.90

(Other sizes in proportion)

ACT NOW! You run no risk. Responsible company back of guarantee. Specify car-model and year-make in ordering—to avoid error. Order from this ad. Descriptive folder sent on request. Batteries shipped by express.

TRIPLEX BATTERY CO., 1109 Tacoma Bldg., Chicago, Ill.



Race Electric Grinder $15.50 F. O. B. CHICAGO

Complete With 3" Emery Wheel, Grooved Pulley and Electric Cord

For sharpening tools, polishing or grinding, the Race Motor Grinder will prove a great convenience in the shop, garage, at home or on the farm; it is a practical machine that will prove its value to every mechanic. It is portable, plugs into any electric light socket, operates on either AC (60 cycles) or DC 110 to 130 volts. Weighs only 7 pounds.

Save $1.00 by Ordering Now This introductory price of $15.50 will prevail until December 31st, after which date the regular price of $16.50 will apply. If not entirely satisfactory after ten days' use, your money will be cheerfully refunded.

RACINE UNIVERSAL MOTOR CO., 53 W. Jackson Blvd., Chicago, Ill.

Phone Harrison 6898 — Exclusive Dealers Wanted

Give yourself a

FLYLOCK KNIFE

Opens and locks by pressing and pulling the slide. Locks shut; can't open in the pocket and cut your fingers.

No nails to break. One hand, one finger, one slide springs open and locks the blade.

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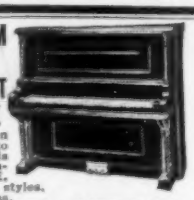

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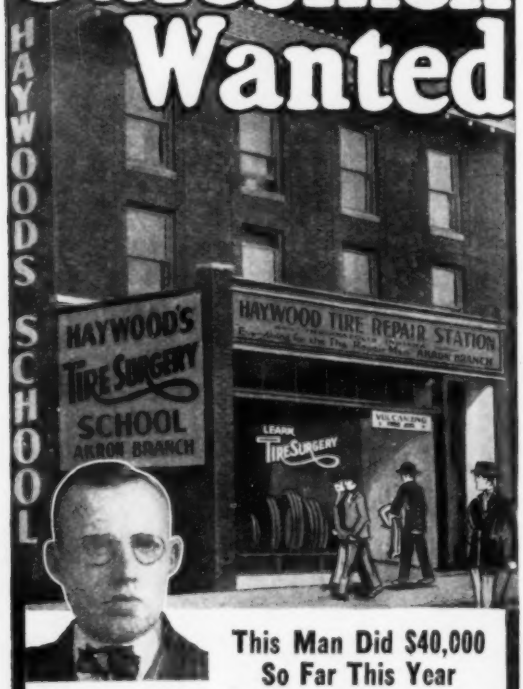

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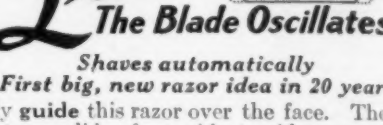

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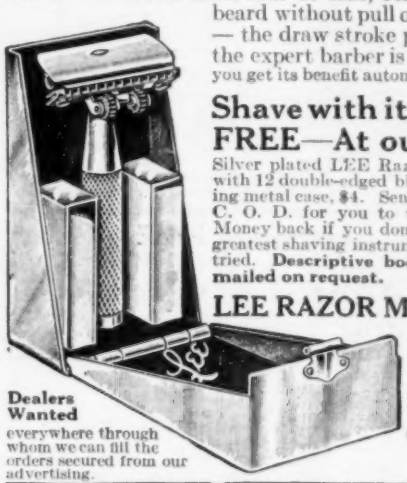

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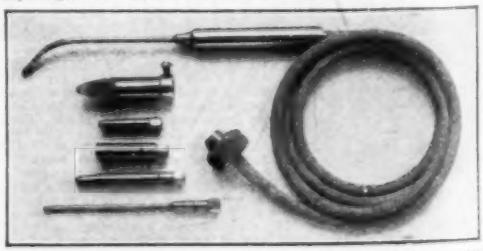

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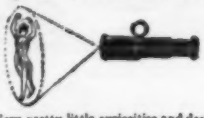

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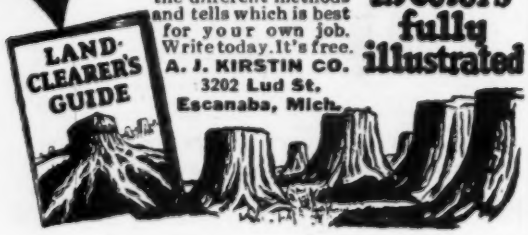

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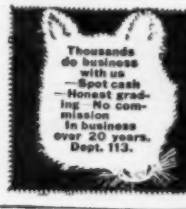

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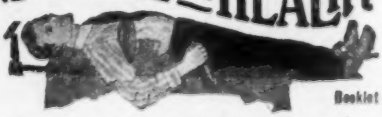

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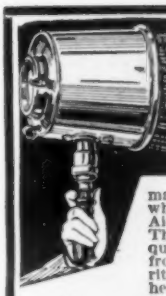

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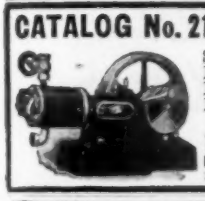
CATALOG No. 21 IS READY Get Yours NOW



Small Steam Engines and Boilers, Gas and Gasoline Engines, ½ H. P. and up, Pumps, Gears, Model Makers' Supplies.

Catalog No 21 sent postpaid or 15c (coin preferred) or stamps.

Modern Engine and Supply Co.
342 Monadnock Block, CHICAGO

Only $45.00 For This Job Complete

Save exhorbitant freight rates and one-half original cost by buying Ford Speedster Bodies knocked-down. Simple, complete instructions furnished, all parts cut to exact fit. Any one can assemble this job. Complete with hood, radiator shell, instrument board, upholstering, metal parts, wood parts, bolts screws, etc.

Not Paper Patterns
All Parts Complete
Flat radiator shell furnished made up. Designed low with lack of wind resistance. Price set up $40, further particulars on request.

The Central Auto Supply Co. Eng. Dep. 120, Louisville, Ky.

DIAMONDS

ON 30 DAYS FREE TRIAL

YOU CAN TAKE 10 MONTHS TO PAY

DIAMONDS are the **world's best investment.** You can enjoy wearing them while they increase in value. The **cheaper** you buy **good diamonds,** the better your investment. Don't pay retail prices when **you can save 40%** by ordering direct from **wholesale diamond importers.** Triple tested absolutely perfect diamonds worth $675.00 cost only $400.00 here. Almost perfect diamonds worth $350.00 cost only $200.00 per carat here. Other sizes cost in proportion. Buy now while prices are low. We guarantee to **refund your money in 30 days** if you desire or will return **all but 10%** if you return your diamond **one year** from date purchased. **WRITE FOR 40% DISCOUNT CATALOG.** Big discounts on all diamonds, men's and ladies' watches and on all kinds of gold jewelry and silverware.

BEITLER & COMPANY 1780 Broadway Div. 115, New York

Can You Write Advertisements?

Do you like to write? Do you sometimes read over the advertisements in the magazines and feel that you could do them better?

Why not take up advertising? It is a profession that pays big salaries and advancement is rapid.

It is surprising how many of the leading advertising men of this country got their start through spare-time study with the I. C. S.

One reason is the completeness of the course. It includes:—

Composition and Diction	Display Arrangement
Punctuating and Editing	Engraving and Printing
Psychology of Advertising	Illustrating
Writing of Copy	Retail Advertising
Fundamentals of Type	Department-Store Advertising
Specimens of Type	Technical and Trade-Paper Advertising
Planning the Layout	Mail-Order Advertising
Advertising Letters	Street-Car Advertising
Catalogs, Booklets, etc.	Outdoor Advertising
Direct Advertising	The Law an Advertising Man Should Know
House Publications	How to Get a Position
Advertising Records	
The Advertising Agency	
Proofreading	

By enrolling with the I. C. S. you will have something tangible to offer when you seek a position. If you are already in the advertising business, the I. C. S. course will speed you toward success.

Mr. Frank E. Fehlman, president of the New York Advertising Club; Robert E. Ramsay, director of Sales Promotion, Advertising and Publicity for The American Writing Paper Co.; Ben J. Sweetland, of the Sweetland Advertising Agency; C. L. Whittier, of N. W. Ayer & Son, and Gilbert P. Farrar, the well-known typographical expert, are just a few of the many I. C. S. graduates who are making good in advertising.

We'll be glad to tell you more about the I. C. S. course in Advertising. Simply send in the coupon for full information.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5582-C Scranton, Penna.

Without cost or obligation please explain how I can qualify for the position, or in the subject *before* which I have marked an X in the list below:

☐ Complete Advertising	☐ Business Management
☐ Local and Retail Advertising	☐ Commercial Law
☐ General and Mail-Order Advertising	☐ Good English
☐ Salesmanship	☐ Business Correspondent
	☐ Private Secretary

Name _____

Street Address _____

City _____ State _____

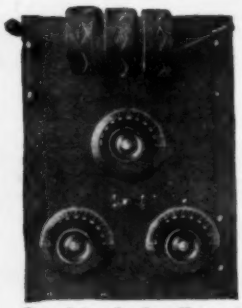
Please Mention Popular Mechanics

Hear the Wireless Concerts at Home

from far and near. The Latest News, Market and Weather Reports now broadcasted by radio by our Government. Stations all about you.

Type "Q" Receiver

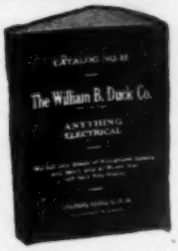
The last word in flexibility of reception



Telephone and telegraph stations of all sizes and wave lengths within your reach. With the use of the various sizes of honeycomb coils, everything in the range of radio is brought into your home.

Consists of a 3-coil mounting and 3 variable condensers of proper capacity. Tuning extremely sharp. Remler dials.

Without detector . . $35.00
With detector . . . 40.00



Duck's 275-Page No. 16 Radio Catalog—Just Out. Send 12 cents in stamps or coin for your copy of this wonderful catalog. Not sent otherwise.

You could spend $3.00 for text books and other catalogs and then not have the contents of this catalog.

Ever since the year 1909 Duck's Radio Catalog has blazed the way with everything worth-while and dependable in radio. This catalog eclipses all previous editions. It is all other catalogs in one. No other is even half as large. The complete catalog of the Radio Corporation, with a wealth of scientific data and diagrams, showing how to build powerful radio telephone transmitters; the Remler, Murdock, and in fact all other catalogs, are in this catalog. Over 50 pages of diagrams and data on radio.

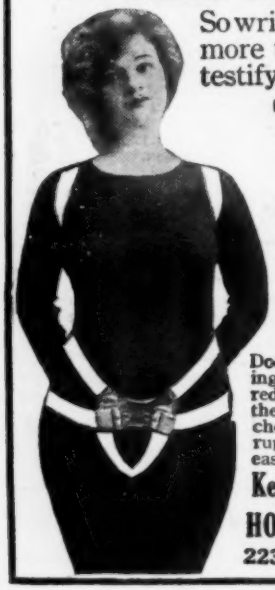
Radio Sets Cost Very Little. Complete sets sell for as little as $20.00—some even less. Today there are thousands bringing into their homes music, concerts and news, hundreds of miles away, and with a loud speaker to replace the receivers on the ears, the entire family may clearly and distinctly enjoy the entertainment.

THE WILLIAM B. DUCK CO., 223-227 Superior St., Toledo, O.

SAVE YOUR BODY

Conserve Your Health and Efficiency First

"I Would Not Part with it for $10,000"



So writes an enthusiastic, grateful customer. "Worth more than a farm," says another. In like manner testify over 100,000 people who have worn it.

The Natural Body Brace

Overcomes **WEAKNESS** and **ORGANIC AILMENTS** of **WOMEN AND MEN.** Develops **erect,** graceful figure.

Brings restful relief, comfort, ability to do things, health and strength.

Wear It 30 Days Free at Our Expense

Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects stooping shoulders; develops lungs, chest and bust; relieves backache, curvatures, nervousness ruptures, constipation, after effects of flu. Comfortable and easy to wear.

Keep Yourself Fit Write today for illustrated booklet, measurement blank, etc., and read our very liberal proposition.

HOWARD C. RASH, Pres. Natural Body Brace Co.
223 Rash Building SALINA, KANSAS

For Boys and Girls Also

9,000,000 Autos Need Help!

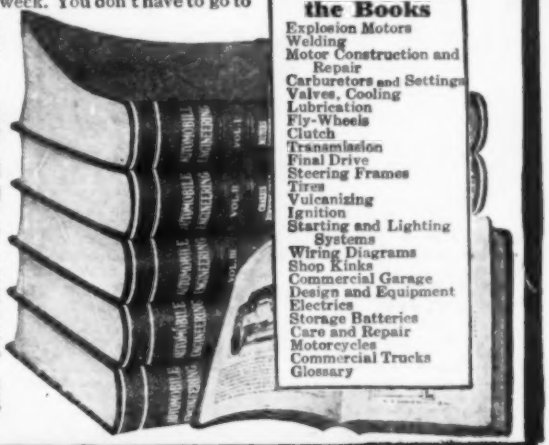
Earn $40 to $150 a Week!

Think of it—over 9,000,000 automobiles are in use in the U. S. There never was a better opportunity for money making than the automobile field offers you right now. Think of the money spent every year to keep all these cars in a going condition. Think of the chances for the repairmen, chauffeurs, engineers and garageowners. Look at the autos being sold—both old and new. Look at the garages springing up here and there. This all means money, money, money for the fellows in the game. Get your share now. Men like you are needed everywhere to fill big paying jobs.

Easy to Learn We have made it easy for you to fit yourself for a job paying from $40.00 to $150.00 a week. You don't have to go to school. You don't have to serve an apprenticeship. Everything is worked out for you by fifteen great automobile engineers so you can become an auto expert in your spare time and keep on earning while you learn.

A Few Things Taken From the Books

- Explosion Motors
- Welding
- Motor Construction and Repair
- Carburetors and Settings
- Valves, Cooling
- Lubrication
- Fly-Wheels
- Clutch
- Transmission
- Final Drive
- Steering Frames
- Tires
- Vulcanizing
- Ignition
- Starting and Lighting Systems
- Wiring Diagrams
- Shop Kinks
- Commercial Garage
- Design and Equipment
- Electrics
- Storage Batteries
- Care and Repair
- Motorcycles
- Commercial Trucks
- Glossary



Auto Books

SIX VOLUMES Sent FREE

Now ready for you—the new 6-volume Library of Automobile Engineering—right up-to-date, showing all the new cars and the latest and best ways of doing things. It covers the construction, care and repair of every kind of automobile, truck and motorcycle. Just chock full of advance information on Ignition, Starting and Lighting Systems, Garage Design and Equipment, Welding and other repair methods. Everything that a mechanic or any man interested in automobiles should know. Written in simple language that anyone can understand. 2700 pages and 2400 pictures, plans, blueprints and wiring diagrams, all bound in tough, wear-resisting material and stamped in gold. Over 75,000 sets have been sold on our free trial—no money down plan.

10c a Day If Pleased

First you see the books in your own home or shop. Just mail coupon. You can read them and use them for 7 whole days before you decide. If you like the books, send only $2.80 in 7 days and $3 a month until the special reduced price of $24.80 has been paid. (Regular price $45.) Along with the set goes a year's membership in the American Technical Society including consulting privileges, tests and free employment service. This part of our offer will be withdrawn when the membership is filled.

No Money in Advance

Don't take our word for it that you can make money with the help of these books. Just mail the coupon and see the books without cost. Then talk it over with some of your friends and get their opinion. Don't waste a moment in sending for the books though. Put the coupon in the mails today. Send no money—just the coupon!

AMERICAN TECHNICAL SOCIETY
Dept. AA-199 Chicago, Illinois

FREE EXAMINATION COUPON

American Technical Society, Dept. AA-199, Chicago, Ill.
Send me the 6 volume set of Automobile Engineering books for a week's free trial, by express collect. I will either return the books in one week at your expense or send you $2.80 as first payment and $3.00 every month until a total of $24.80 is paid. With these books I am to receive a free membership in your Society, including Consulting Privileges, Standard Tests and FREE Employment Service.

Name.....

Address.....

City..... State.....

Reference.....

"Some Present" from "Dad"

What a wonderful thing it will be for any boy whose Dad makes it possible for him to take his first easy lesson on Christmas Day on his very own

BUESCHER

TRUE-TONE SAXOPHONE

Of all musical instruments, this is a man's or a boy's instrument. It is the easiest of all wind instruments to play, and one of the most beautiful. You can learn the scale in an hour's practice and in a few weeks be playing popular airs. Nothing can take the place of a Saxophone for home entertainment, church, lodge or school. In big demand for orchestra dance music.

FREE TRIAL
Easy Payments

We make it easy for you to get a Buescher True-Tone Saxophone or other musical instrument. You may order any Buescher instrument without paying in advance, and try it six days in your own home, without obligation. If perfectly satisfied, pay for it on easy payments to suit your convenience.

Buescher-Grand Cornet

The Buescher-Grand Cornet is exceptionally easy to blow, yet possesses a tone of wonderful volume. If you expect to learn to play a Cornet, you should by all means have a good instrument. With a Buescher-Grand, you own an instrument similar to that with which the greatest cornetists of America have made their reputations. If interested in a Cornet or other instrument, ask for our complete Catalog—sent free.

Free Saxophone Book

"The Origin of the Saxophone" tells just what each Saxophone is best adapted for; when to use singly, in quartettes, sextettes, octettes, or in regular band or full Saxophone Band, and how to transpose for cello parts in orchestra. A copy is yours free. Just send your name.

BUESCHER BAND INSTRUMENT CO., 2537 Buescher Block, Elkhart, Indiana

Makers of Everything in Band and Orchestra Instruments

BUY GEARS FROM GEAR SPECIALISTS

We ship immediately from stock new guaranteed nickel steel TRANSMISSION GEARS, FLY WHEEL GEAR RINGS, PINIONS, RING GEARS, DIFFERENTIAL PARTS, and AXLE SHAFTS **FOR ALL CARS AT LOWEST PRICES.** When ordering state make, model of car, also number of teeth on gears. To order ring gears and pinions give ratio and state if you want straight or spiral type. **BIG DISCOUNTS TO DEALERS, GARAGES, REPAIR MEN.** Get our prices today, we save you money. Our new nickel steel gears are sold with a money back guarantee. **Buy direct from us.**

MECHANICS GEAR WORKS, Service Dept., 1446 Catalpa Ave., Chicago, Ill.

PLANS FOR POULTRY HOUSES!

All styles. 150 illustrations; secret of getting winter eggs, and copy of "The Full Egg Basket." Send 25 cents. INLAND POULTRY JOURNAL, Dept. 74, Indianapolis, Ind.

POLISH, DAUBER and BRUSH combined in one convenient article, with Nickel Top and handsome Leatherette Case. Polish is in a tube enclosed in metal case on top of brush, and when tube is used up, new ones may be obtained at leading stores everywhere, 25 cents. Buy of your dealer or order direct, stating whether black, tan, mahogany or white is desired. Fine opportunity for agents.

Splendid Christmas Gift, $2 prepaid

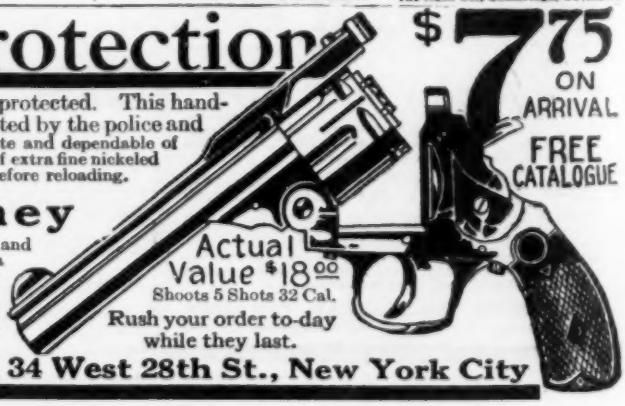
Address Sales Dept.
The Kaxo Co., Cambridge, (39) Mass.

Profit and Protection

Carry this revolver and be always fully protected. This handsome firearm is the style of weapon adopted by the police and secret service of many cities. The most accurate and dependable of firearms. Has popular break cylinder. Made of extra fine nickeled steel by expert mechanics. Shoots five times before reloading.

Send No Money

Order to-day. Just send your name and address and state which style revolver you want. Pay Postman our price and postage on arrival. Money back if not completely satisfied after examination.
No. **2012** is 32 cal., 3¼-in. barrel. Pay Postman $7.75 and postage on arrival.
No. **2512** is 38 cal., 3¼-in. barrel. Pay Postman $9.00 and postage on arrival.



Rush your order to-day while they last.

$7.75 ON ARRIVAL

FREE CATALOGUE

Paramount Trading Co., 34 West 28th St., New York City

A Home and Income

For You in Sunny Florida

Be Independent—Own a Grapefruit and Orange Grove—A Truck or Poultry Farm. Increase Your Income

You Can Start a Grove Today Under Our New Plan

Develop a profit-earning fruit farm without leaving your present position—provide for your future. A small payment now and a few dollars invested each month should reap large and increasing dividends from year to year. You can now secure the land you want on payments as low as **$1 per acre per month.**

A profit-producing fruit grove is a permanent investment and provides protection against old age.

THE RIGHT LAND IN THE RIGHT LOCATION AT THE RIGHT PRICE

WE HAVE IT—ANY SIZE FARM

From 10 to 640 acres or more. These splendid lands are suburban to Tampa, the metropolis of South Florida. Here you find the most healthful, the most delightful climate in North America. For **Ten** years we have been right here helping develop Hillsboro—the banner agricultural County of Florida, and we are still here to serve you and to help you obtain the farm you want. Whether it's 10 or 20 acres, for a Fruit Grove, Poultry or Truck Farm, or from 80 to 640 acres for General Farming, Cattle and Hog Raising, we can give it to you on very easy payments extending over 2 or 3 years' time to suit purchaser.

Groves Developed for Non-Residents

If you want to remain in your present position for a few years we can develop a grapefruit and orange grove for you. When you are ready we will clear your land, furnish fruit trees, plant and care for your grove until you are ready to look after it.

We Raise Our Own Guaranteed Citrus Trees in Our Own Nurseries

This insures every purchaser the best fruit trees that can be grown. This also insures a successful grove. We can save you money on planting and caring for your grove.

Fill out and mail us the coupon today and receive our large descriptive book FREE!

NORTH TAMPA LAND CO.

C. E. THOMAS, *Pres.*

Suite 520 Monon Bldg. CHICAGO

$300.00 to $500.00 Per Acre Profit

May be made growing truck. This is not an unusual return for truck farmers in the Famous Tampa district. All kinds of vegetables can be grown. Big prices are paid for early potatoes, Winter cabbage, Bermunda onions, tomatoes, celery and dozens of other vegetables during the Winter and early Spring, when the north is covered with ice and snow. Strawberries, Melons, and other small fruits also yield large profits.

Poultry a Big Money-Maker

Hillsboro County is without question, one of the most favored locations in the United States for poultry raising. Tampa affords an unlimited market for chickens, eggs and ducks. Commission houses right here in Tampa City do a tremendous export business in poultry and eggs and the local demand is also very large. This insures a steady cash market at good prices.

Stock Raising and General Farming

We also have lands especially adapted to general farming, Long Staple Cotton, Corn, and Live Stock. Hog and cattle raising has never been so profitable before. High prices for all meat and pork products must continue—Florida stock raisers should make big money for many years to come.

Write for Facts About Sunny Florida

IT COSTS YOU NOTHING TO LET US PROVE TO YOU that we have the land you want—in the location you want—at a price you can afford to pay and on the easiest terms you can imagine. Let us show you.

Coupon for FREE Book on Florida

NORTH TAMPA LAND CO.

Suite 520 Monon Bldg., CHICAGO

Please send me your large Illustrated Book "The Call of the Southland" on choice Citrus Fruit and Truck Farms suburban to Tampa, Florida, and information on how I can have a grove developed on the monthly payment plan. **P. M. 12-21**

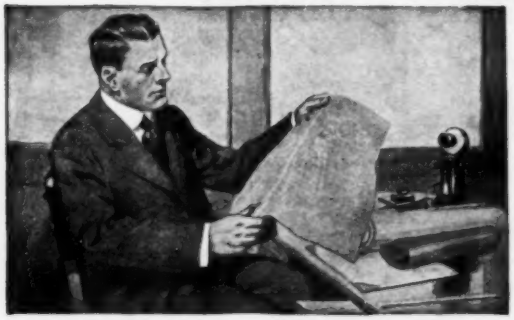
Name.....

St. No......

City.....

State.....

Mechanical Engineering



Learn at Home!

EMPLOYERS everywhere are looking for men with mechanical ability. Splendid salaries and rapid advancement are offered those with special training.

There is an easy, delightful way in which you can learn right at home in spare time. For 30 years the International Correspondence Schools have been giving men and women just the training they need for success in mechanical engineering and more than 200 other subjects. Hundreds of thousands have stepped into good positions through I. C. S. help, but never were opportunities so great as now.

Let the I. C. S. help *you*. Choose the work you like best in the coupon below, then mark and mail it today. This doesn't obligate you in the least and it will bring you information that will start you on a successful career. This is your chance. Don't let it slip by. The most important thing you have to do is to mark and mail this coupon *now*.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5583-C SCRANTON, PA.

Without cost or obligation please explain how I can qualify for the position, or in the subject *before* which I have marked an X in the list below:

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting & Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN or ENG'R
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING & HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ Pharmacy
- ☐ BUSINESS MANAGEM'T
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Show Card & Sign Ptg.
- ☐ Railroad Positions
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ Private Secretary
- ☐ Business Correspondent
- ☐ BOOKKEEPER
- ☐ Stenographer & Typist
- ☐ Certified Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Common School Subjects
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILES
- ☐ Mathematics
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ BANKING
- ☐ Spanish
- ☐ Teacher

Name.....

7-1-21

Street and No.....

City..... State.....

Occupation.....

Please Mention Popular Mechanics

ONE WHOLE YEAR TO PAY!

Cash-Price Bargains!

A SMALL deposit down is all the ready cash you need under the popular KLEIN plan! Examine diamond first, then decide. Order from this ad on **easy terms at cash bargain prices!**

We Trust You!

No annoying delays or red-tape to KLEIN credit! Deal direct and save the profits of all middlemen. Prices smashed to before-the-war figures; act quick and save HALF the diamond price in your own pocket!

$5 a month! 14 karat solid gold massive ring for gentlemen, richly hand engraved; set with big, brilliant, perfect cut BLUE WHITE DIAMOND. Be sure to state finger size. Only $19 down, $5 a month for 12 months. Was $125.00. Price reduced to **$79**

Only $3 a month! for 12 months. $12 down pays for this elegant, stylish hand-engraved Lady Lorraine solitaire ring. Set with large brilliant perfect cut BLUE WHITE DIAMOND. $75.00 quality. Price now only **$48**

Send No Money!

Just send name, address and paper strip for finger size—**not one penny now!** Wait until you see the unbeatable BARGAIN we send you.

De Luxe Catalog FREE!

Shows nothing but genuine Diamonds, solid gold Jewelry, standard makes of watches, silverware, etc. Full of thrifty gift suggestions, first to show styles for next season. The only book that offers One Whole Year's Time. A postal brings it free! Send today!

Dept. 1210

KLEIN & CO. 122 W. MADISON CHICAGO

Christmas Suggestion

A Dunlap Cream Whip! Known and wanted by every woman. Whips cream in 30 seconds. Whips even top bottle cream.

Standard model, earthenware bowl, $1.25 (West $1.50). De Luxe gift model, casserole bowl $2.50 (West $2.75), special gift pkg.

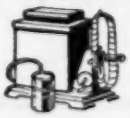
Mailed promptly on receipt of price, if dealer hasn't it. Be sure to mention his name.

Bowl has special non-slip bottom

CASEY HUDSON COMPANY
387 East Ohio St., CHICAGO

Dunlap Cream Whip

MOVING PICTURE FILM



Real New Movie Film 2c A Foot
Fits any Machine

All colors. Many scenes. Your favorite Actors. Have your own movie show at home. Send $1 for 50 feet.

MOTION PICTURE FILM SUPPLY
Hollywood, Calif. P. O. Box 87-E

GILBERT TOYS

Gilbert Engineering Institute for Boys

FREE membership for every Gilbert Toy Boy with an opportunity to earn degrees, honors, and handsome diplomas.

ERECTOR

The World-Famous construction toy

Boys can build toy steel bridges, skyscrapers, battleships, machines, with Erector and never lose interest because it is ***genuine,*** just like the real thing.

Gilbert Toys *are genuine*

Gilbert Toys contain complete sets of engineering toys each with full equipment and a big book of instructions to perform marvelous experiments in Chemistry, Engineering, Hydraulics, Magnetism, Light, Sound.

The wonderful Gilbert outdoor wheel toy enables you to make coasters, wagons, geared speedsters, wheelbarrows, baggage trucks, with only a wrench and a screw driver.

Gilbert Boy Engineering Book for 1922

"How to High Jump," "World Famous Engineering Feats and Men Who Accomplished Them," "Men and Events That Made Sports History," "Theory of Wireless," "Experiments in Magic and How to Perform Them," "Chemistry Experiments and How to Perform Them," and a number of other intensely interesting articles, including a complete catalog of Gilbert Toys.

COUPON

Mail this coupon today to Mr. A. C. Gilbert, President, The A. C. Gilbert Co., 477 Blatchley Ave., New Haven, Conn. Enclosed is ten cents for which send a copy of the Gilbert Engineering Book for 1922 and a sample copy of Gilbert Toy Tips to:—

Name .....

Street .....

City ..... State .....

The Famous No. 4 Erector Set

complete with motor **$5.00**

Erector is only one of the many famous Gilbert Toys. Send for catalog.

AT LAST the right kind of tool chest—equipped with the right kind of tools!

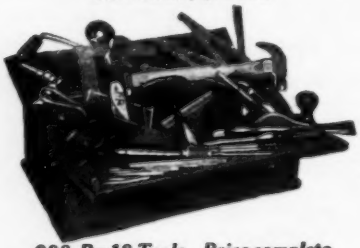
STANLEY SW

News of real interest and importance to the craftsman, the inventor, the carpenter and the amateur, young or old.

STANLEY

Tool Chest No. 888

888-A—32 Tools. Price complete with Chest, $35.00



888-B—18 Tools. Price complete with Chest, $25.00

888-C—12 Tools. Price complete with Chest, $15.00

THE famous Stanley *Tools* are now obtainable in Stanley *Tool Chests* a complete "carpenter shop" housed in a strong, protective container that fills a long-felt want.

Among the different types and sizes of Stanley Tool Chests there is one which will exactly suit you.

A Stanley Tool Chest is the best way to *buy* tools—and the best way to *own* and *use* them. Ask your hardware man to let you look at these new Stanley Tool Chests.

Send for folders illustrating these new chests; ask for 9L.

Boy Scouts of America: you will find these chests listed in your November Equipment number of Scouting.

THE STANLEY RULE & LEVEL PLANT
THE STANLEY WORKS
NEW BRITAIN, CONN. U.S.A.

THERE is a Corona dealer near you who will gladly deliver Corona for you at Christmas time, gaily wrapped in this attractive holiday box over its own smart traveling case. If you don't know his address, the coupon below will bring it to you.

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To the Invalid—to make the long hours fly.

To any Ambitious Friend—as a certain help toward success.

To the College Boy or Girl—for better work; higher marks.

To your Business Associate—a traveling private secretary.

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☐ Please send me the latest Corona Booklet No. 8.
☐ Please tell me the address of the nearest Corona store.

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STRUCTO

MAKE MEN

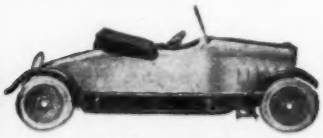
Build Autos that Look and Run Like Real Cars!

BUILDING a STRUCTO Automobile, Truck or Tractor is the next best thing to building a real one. STRUCTO TOYS are realistic toy reproductions of real automotive machines. They have parts like real cars. You assemble the parts and build your own Auto, Truck, or Tractor. You can build a fast, sporty, Racing Car; a classy Roadster; a big Dump Truck or a sturdy Tractor.

STRUCTO models run fine, too. Strong, powerful motors drive them straight ahead, around in a circle, up grade or on the level. Some have sliding gear transmission and regular "big car" differential; others have direct shaft drive with die-cast gears on the rear axle, while the Tractors have directly connected gears that give great pulling power. They are all handsome, strong, sturdy machines you can have a lot of fun with, indoors or outdoors.

Six dandy Auto-Builder models to choose from; Nos. 8, 10, 11, 12, 14 and 16; all pictured here. Any boy can build one; just put the parts together and you'll have an Automobile, Truck or Tractor that looks and runs just like a real one! Look over these models; read the specifications and decide which you're going to get. Any fellow's Dad will be glad to see him build a STRUCTO Auto because it helps him understand real cars.

ANY boy can build a STRUCTO TOY. The Nos. 8, 10, 11, 12, 14 and 16, shown below, come complete in STRUCTO Auto-Builder Outfits like the one shown above. Everything is complete, even a screw driver and wrench. Building these toys is great fun and shows the principles of automobile engineering.



Structo DeLuxe Auto; Auto-Builder Outfit No. 12. Just like a real car! 16 in. long. Triple-unit motor. "Big car" transmission and differential. Two speeds forward and one reverse. Disc wheels, low body and other regular car features. Orange color - - - - - **$10.50**

Structo Racing Auto; Auto-Builder Outfit No. 8. A fast, speedy racer, 16 in. long. Powerful motor; direct shaft drive. Artillery type wheels. Green color and rakish lines - - - - - - - - - - **$5.50**

Structo Dump Truck; Truck-Builder Outfit No. 14. Triple-unit motor; sliding gear transmission; forward and reverse speeds. 18 in. long. Has dumping attachment. Red color - - - - - **$12.00**

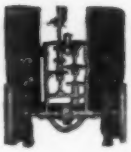
MADE BY STRUCTO

TOYS OF BOYS

Here's Fine Fun for All Boys!

THERE are also four fine Ready-Built STRUCTO models; Nos. 40, 42, 44 and 48; also shown at right. These are Ready-Built for you and ready to run when you get them. They're wonderful machines and have strong motors that keep them going a long time. Finished in colors and very realistic in appearance and action. Each one comes in its own box. Look for these, too, when you go Christmas shopping.

Ask for STRUCTO TOYS in the Toy Department, Hardware Store, Toy Store, or any store that sells good toys. Be sure to see the name, STRUCTO TOYS, on the box because then you'll have the best ones. If you cannot find the one you want we will send it to you direct upon receipt of price printed here. West of Denver, Colo., and in Canada, these prices are a little higher on account of extra transportation charges.



Just like a Real Car! The No. 12 Model has transmission and differential shown here. All these toys have parts like real machines.

Roadster Auto; Ready-Built model No. 40. A strong, speedy car, 10½ in. long. Will run a long time with one winding. Red with black trimming, **$3.50**

Caterpillar Tractor; Ready-Built model No. 44. 11½ in. long. Very realistic in action. Disc harrow included. Green with black trimming. - - - **$5.00**

Contractor's Dump Truck; Ready-Built model No. 42. 12 in. long. Body dumping attachment. Orange with black trimming - - - - - **$4.25**

Caterpillar Whippet Tank; Ready-Built model No. 48. 12 in. long. Gun mounted in turret. Gray with red trimming. **$5.00**

Yuba Tractor; Tractor-Builder Outfit No. 16. A perfect reproduction of this well-known Tractor. Double-unit motor, control handle and stop and start lever. One trailer included. 20 in. long over all. Blue and red color - - - **$8.50**

Structo Bear Cat Auto; Auto-Builder Outfit No. 10. A sturdy powerful roadster, 16 in. long. Single-unit motor; direct shaft drive. Start and stop lever. Red color - - - **$7.50**

Structo High Wheel Tractor; Tractor-Builder Outfit No. 11. Triple-unit motor. Start and stop lever. Most powerful tractor of its size. Can be steered with wheel or strings attached to steering bar. Green color. One Trailer included. - - - - - - - - **$7.50**
Extra Trailers, each - - - **1.00**

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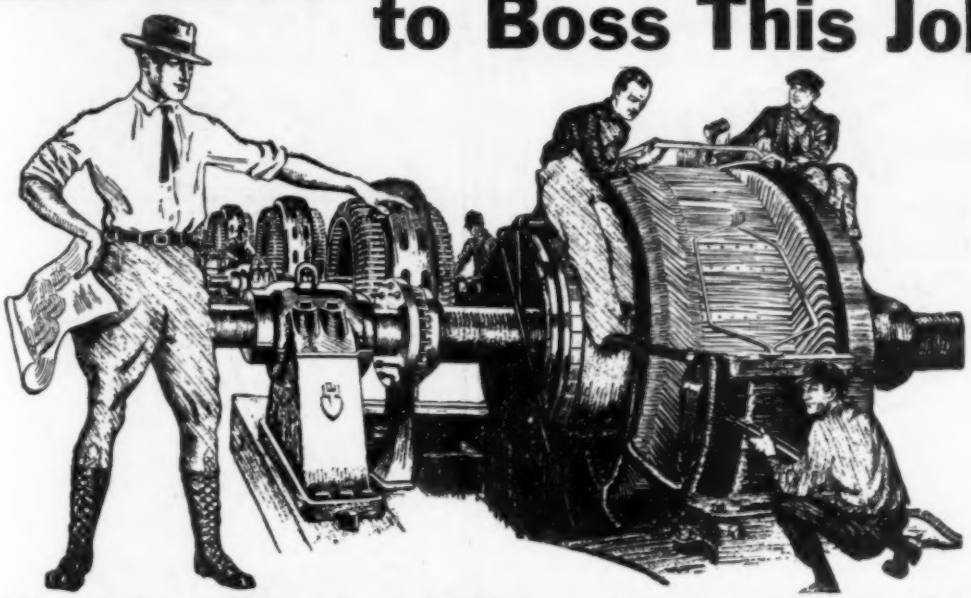
YOU TOO Can Learn to Boss This Job



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Thousands of untrained men are out of work.

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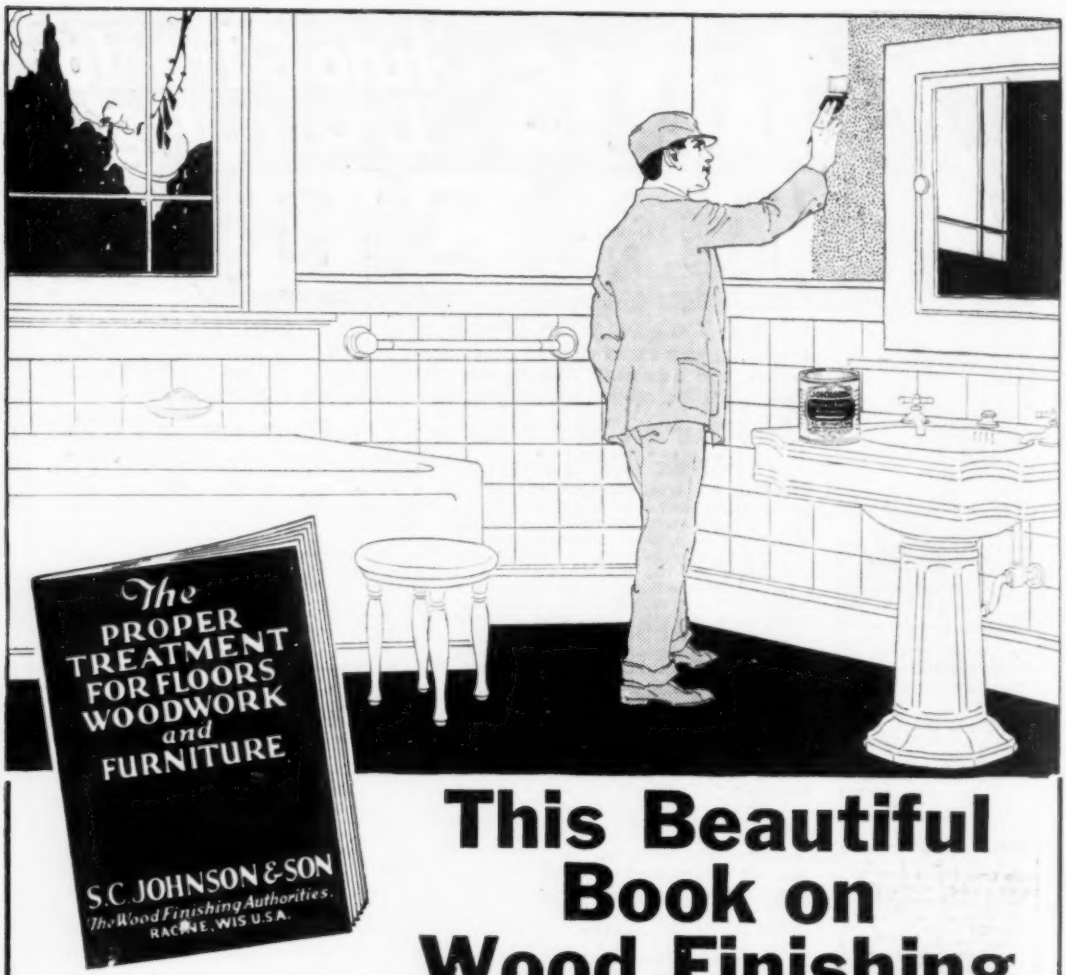

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